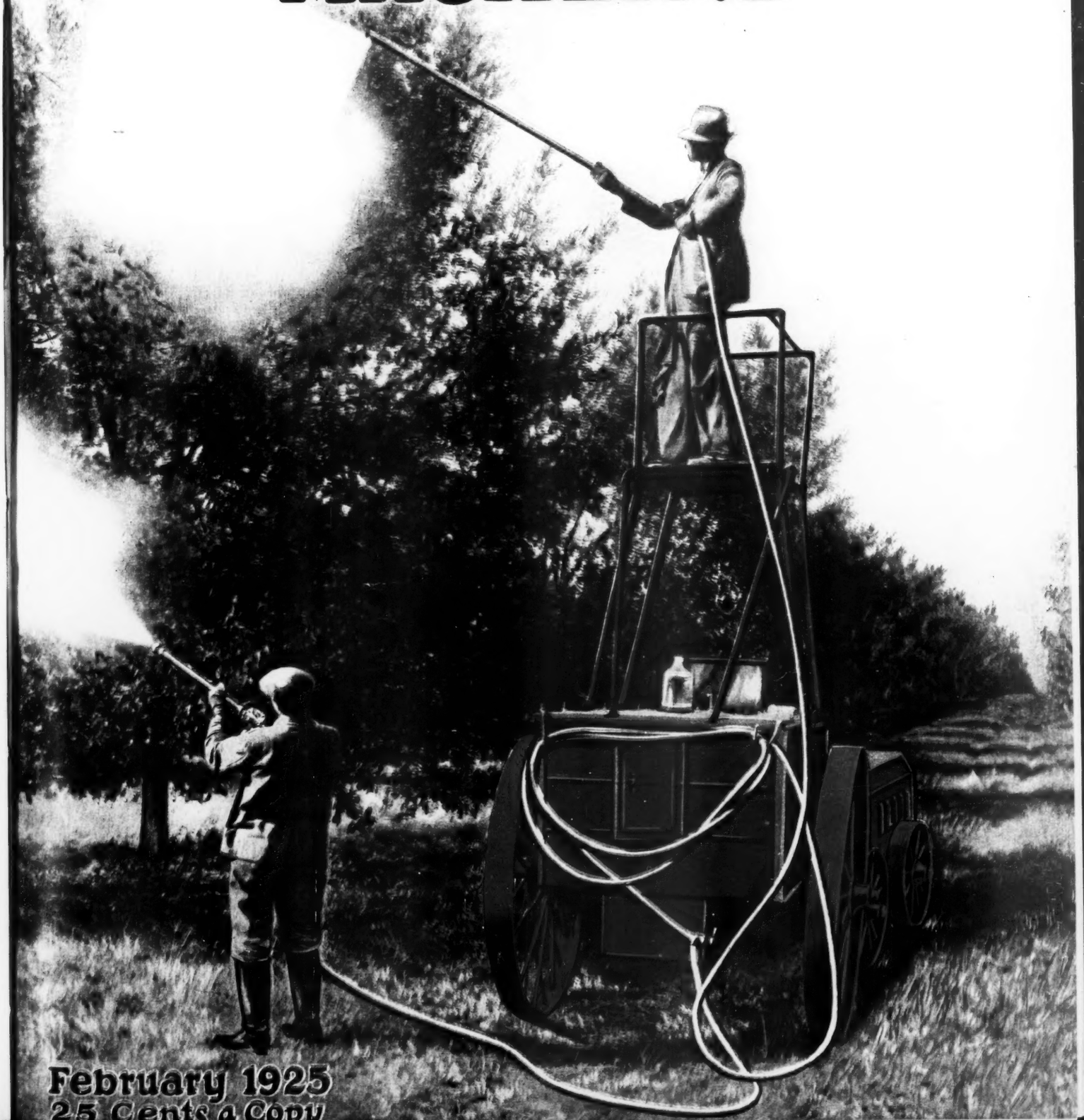
AMERICAN FRUIT GROWER MAGAZINE



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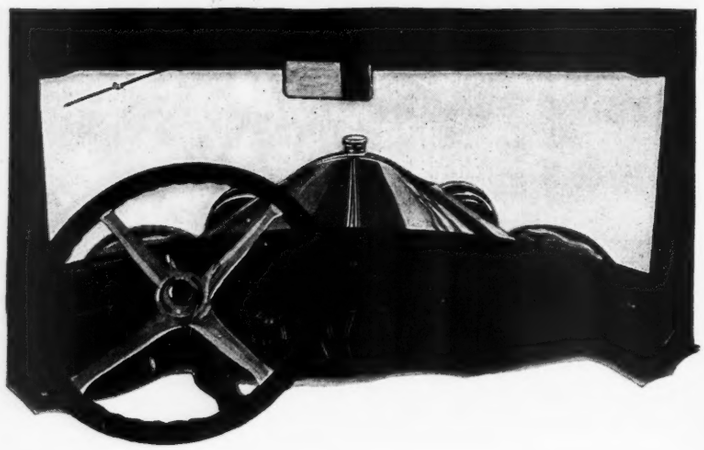

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Interesting Facts About Spray Materials

By Glenn Howe Joseph

Kansas State Agricultural College

FROM the time that fruit growing became a commercial proposition, two methods of procedure have been used for combating insects and diseases. One of these consists in providing sanitary conditions in the hope that the plants will be kept comparatively free from infestation. The other consists in applying poisonous materials so that the insects and diseases will be destroyed or prevented from harming the plants. After about 1900 years of recorded experience, the first of these methods, while undoubtedly of value, has been found inadequate for meeting the situation. Poisonous materials are now depended upon largely for controlling insects and diseases, particularly those infesting fruits.

In view of the importance of poisonous materials in the fruit industry, and the developments which have taken place in the manufacture of these materials, it seems worth while to review the important facts regarding them.

White Arsenic—The Starting Point

Arsenic has been employed as a poison for about a thousand years. Several centuries ago in Europe, arsenic was taken in regular doses by many court beauties to cause the peculiar whiteness of skin so much cherished at that time. During the nineteenth century no other poison received such support from professional murderers and homicides as did arsenic. However, within the last two decades the use of arsenic as a human poison has been decreasing due to the ease of detection and to the finding of more efficient instruments of death.

For poisonous sprays to be used against insects, the first material to be thought of would be common white arsenic, or correctly, arsenious oxide. This compound can never be used, however, due to its slight solubility in water. The one or two per cent that would dissolve in the spray would cause more damage to the foliage than the insects for which it was intended as food.

Most of the arsenic produced in America comes from the western states as a by-product in the production of precious and semi-precious metals. The arsenic bearing ore, on being treated in the smelters, loses its arsenic as the volatile arsenious oxide which is later recovered from the fumes. Much arsenic is now being recovered from old smelter dumps that were allowed to pile up before arsenic became so valuable. The crude white arsenic is further purified by re-evaporating and again condensing.

Paris Green

The arsenicals first made their appearance as insecticides in this country about 1860, when Paris Green was used against the Colorado potato beetle. Twelve years later LeBaron suggested the use of this material as a spray for fruit trees. Much opposition was given to the use of a poison for spraying fruits. It was thought that the poison would endanger the lives of those eating the fruit. It was soon shown, however, that this idea was false, and spraying became quite common.

Paris Green was first mentioned in chemical literature by Ehrman and Liebig in Europe in 1834. It was made then, and is today, by mixing hot water solutions of white arsenic and copper acetate, or verdigris, as it is sometimes called. Near the close of the nineteenth century Paris Green was being used extensively by fruit growers. The demand for it grew so rapidly that the makers were forced to use less care in its preparation. At that time the white arsenic was the cheapest part of the material and so more and more of it was left in the finished product. Soon the burning from this extra arsenic became so great that laws were passed regulating the manufacture of Paris Green. The commercial product today usually contains some copper arsenate, white arsenic, and even free arsenic as a metal. Paris Green, though high in arsenic content, has been practically displaced by the arsenates of lead and calcium.

Lead Arsenate

The study of the arsenates of lead was begun many years before anyone ever thought of using them as insecticides. Lead arsenate was prepared by the great Swedish chemist, Berzelius, about a hundred years ago and was later studied by another chemist, Mitscherlich, in 1843. It was in 1892 that Moulton, chemist for the Massachusetts Gypsy Moth Commission, first prepared lead arsenate for insecticide work. He made it by mixing sugar of lead solution with sodium arsenate. It was made by this method until 1908, when Luther and Volck patented their process of making it with litharge and arsenic acid.

During the time since 1908, many methods have been patented for preparing this insecticide. Nearly all of these patents are for variations in the same process. Most of the lead arsenate on the market today is made after one of Luther and Volck patents. Very recently there have been made attempts to prepare arsenate of lead by electrolytic processes. There are two lead arsenates on the market today, the acid lead arsenate and the normal lead arsenate. The normal arsenate is much less liable to injure the foliage than is the acid arsenate, but the killing dose of the acid salt is much less. For this reason about 95 per cent of the arsenate sold is the acid lead arsenate, notwithstanding its more injurious effect on the foliage.

Arsenate of Lime

Arsenate of lead had been used 20 years before an attempt was made to substitute the arsenate of lime, or calcium arsenate. The pure calcium arsenate was prepared in 1844 by Rammelsburg. It remained as merely a chemical compound for about 75 years. It was due to the stimulating effect of the World War and its effect on the cotton markets that calcium arsenate was suggested as a substitute for lead arsenate. A thorough search was made for a cheaper and more efficient insecticide for use against the cotton boll weevil. As a result of these tests, the United States Department of Agriculture, through the Bureau of Entomology in Louisiana, recommended calcium arsenate as the best material known for use against the cotton boll weevil. Later it was shown that this material is equally satisfactory for use against any biting insect on fruit trees.

In the preparation of calcium arsenate, perhaps the most direct method would be to use slaked lime solution and arsenic acid, for by this means the only other product of the reaction would be water. To carry this out on a commercial scale, however, would require the handling of enormous amounts of liquid on account of the slight solubility of slaked lime in water. To eliminate this undesirable feature, the quicklime could be slaked with a water solution of arsenic acid. Here again trouble results and a worthless product would be formed. The surface of the stone lime would come in contact with an excess of arsenic acid, and on account of the slow surface action on the lime, other compounds would be formed containing varying amounts of arsenic, all with more arsenic than desired, and hence burning would occur on foliage treated with this mixture of unknown composition. It would take finely ground lime and slaking under constant stirring with the arsenic acid solution being fed in at a carefully

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The Selection of a Proper Spraying Outfit

By E. C. Sherwood
West Virginia University

THE PROFIT which a fruit grower realizes is made almost entirely from that portion of his crop which is marketable. Production of the greatest possible proportion of marketable fruit, therefore, is highly desirable. This depends in large measure upon the effectiveness of control of fungous diseases and insect pests. Sprays for the control of these troubles cannot be fully effective unless they are applied promptly and thoroughly at the proper time. Neither dispatch nor thoroughness of application can be accomplished without proper and necessary spraying equipment. A judicious selection of such equipment cannot be made until careful consideration has been given to the various factors involved.

In this article, no attempt will be made to give an exhaustive discussion of all the numerous and complex factors which might have a possible bearing upon the subject. It is intended rather to discuss briefly those factors which are deemed to be of the greatest importance in assisting the grower to make a wise selection of the spray outfit most adapted to his needs. Although these factors are more or less interrelated, they may be conveniently discussed under (1) Mechanical Features; (2) Factors Determining the Capacity; and (3) Types of Sprayers.

Mechanical Features

Since effective and economical spraying can be done only with carefully selected machinery, it is important to consider the sprayer from a mechanical standpoint. According to Prof. O. G. Anderson, of Purdue University, lightness, strength, durability, efficiency, simplicity of construction, and accessibility of parts requiring attention are the requisites of a good spraying machine. Probably no machine which fully meets all these requirements has ever been constructed, and, as the grower is obliged to buy sprayers which are on the market, he should endeavor to obtain one that most nearly approaches this ideal construction.

The Pump

The most important single feature to be considered is the pump. All the important parts—cylinders, plungers, valves, and valve seats—should be made of the best materials, otherwise the expense of upkeep and depreciation will be too high. Furthermore, parts made of poor materials may give way just when critical sprays are being applied. The agitator should be efficient and the air chamber should be strong and of good size. Other necessary features are a pressure gauge and a smoothly working relief valve. The newer types of pressure regulators, however, are more desirable than the simple relief valve. The best combination of all these features is not found in cheap machines. Sprayers of approximately the same grade vary considerably in price, but cheap outfits are quite often neither satisfactory nor economical.

What kind of spraying outfit shall I buy?

Factors Which Determine the Capacity Needed

Regional and Local Problems.—One very important factor in determining the capacity of the sprayer needed, and one which is frequently overlooked by the grower, refers to the problems in disease and insect control which are peculiar to the region or locality. The orchardist will not have the proper basis for determining the capacity of a sprayer needed until the prevailing troubles and the critical sprays for their control are ascertained. In one section, for example, control of codling moth may be the principal problem. Here, the critical time is the calyx spray, which need only be completed before the calyx-cups have closed. If the spray is begun promptly after most of the petals have fallen, 10 or 12 days may be available for the application. Possibly two weeks or more may be allowed if several varieties which bloom at different times are arranged in blocks.

In another section where apple scab is the disease most to be feared, the grower may find it necessary to complete an application during the cluster-bud stage in not more than five or six working days; in fact, the available time is more likely to be less than this. It may even be necessary to make two complete pre-blossom sprays, and a safe margin should be allowed for delays due to rain and breakdowns. The spray equipment must be of sufficient capacity, therefore, to cover the orchard within the effective time limits of the critical sprays. This time limit, however, must now be considered in its relation to other factors.

Size of Orchard.—The most important factor is the size of the orchard, but the age and size of the trees must always be considered directly in relation to the acreage. It must be remembered that as the trees become larger with each succeeding year, greater demands will be made upon the sprayer. Thus, an outfit which may be adequate at the time of purchase may not later have sufficient capacity to cover the orchard within the necessary time limit.

Available Labor.—The amount and character of labor that is available may become an important factor to be considered. Very frequently it is hard to obtain men to perform the

(*Continued on page* 48)

The Spraying of Black Raspberries

By R. B. Wilcox
Bureau of Plant Industry
United States Department of Agriculture

RASPBERRIES have many insect and fungous enemies, the most common of which is anthracnose. It occurs wherever raspberries grow, attacking both cultivated varieties and the wild plants of woods and fence rows. On the canes of these brambles the disease causes spots which cannot fail to catch the eye. There are other diseases more serious in the nature of their attack and in the damage caused, but there is none so quickly recognized. When a raspberry field loses vigor and produces a meager crop, therefore, anthracnose often gets the blame and the energetic fruit grower decides, "We will spray."

Anthracnose Causes Much Damage

It cannot be denied that this disease sometimes causes considerable damage. The loss of vigor and consequent reduction of crop are very hard to measure. Anthracnose aggravates injury from drought, so that in connection with dry weather it may cause serious loss. Again, a late infection often stunts or kills spurs and tips on the young growth and, of course, reduces the fruiting wood and crop for the next season.

Many years ago it was discovered that anthracnose would yield to fungicides, and a number of spray schedules have been published for the raspberry. The earlier of these recommended Bordeaux mixture; later, lime-sulphur was advised. It is significant, however, that the application of sprays to brambles has never become a settled practice, save in a few sections of isolated cases.

Spraying Demonstration Gives Unexpected Results

A demonstration of spraying for anthracnose control in 1919, at an Ohio field station of the United States Department of Agriculture, gave unexpected results. Previous experiments in the same locality by the Ohio Experiment Station had shown some leaf burning to follow the use of Bordeaux mixture. In the Department's experiments, the most recently developed schedule was followed, which called for three applications of lime-sulphur. Unavoidably, the dormant spray was not applied until the buds had just started growth, and the solution was diluted somewhat from dormant strength because of fear of injury. Frequent rains delayed the second application, also, until the young shoots had reached a height of from eight to 12 inches; lime-sulphur, 1-40, was used. The third spray was given immediately after blossoming. Some plats received only a single application. Adequate checks were left. These experiments were conducted on black raspberries of the Plum Farmer and Cumberland varieties, using quarter-acre plats.

Where three applications were made, the anthracnose was very well controlled. The first two applications alone reduced the number of spots but did not entirely prevent them. From the single standpoint of disease control, the demonstration was successful. However, other factors entered into the question of profit and loss.

Anthracnose Controlled but Yields Decreased

Shortly after the second application a little burning was noticed on the Plum Farmers, some leaf tips and margins having been injured, but apparently there was no real damage. At harvest time no difference was seen in the vigor of the sprayed and unsprayed rows, but a careful record of all fruit picked from the various plats showed *a reduction of 26 per cent* in yield of the sprayed plants.

The Cumberlands showed much more decisively the damage which had been done. Before the third application a striking difference could be seen on the sprayed plats. Those which had been treated twice were somewhat stunted and their leaves were a little smaller and of a lighter green color, although very little local burning could be found. Because of this appearance, the commercial lime-sulphur solution was used on only part of the plats for the last application, being replaced by self-boiled lime-sulphur. This substitution made no difference in severity of the final injury.

Before the harvest commenced, it was obvious that great damage had been done the Cumberlands. The lower leaves were yellow, the others lighter than normal. Laterals had not made proper development. And yield records showed that about four times as much fruit had been picked from the checks as from the sprayed plats, and that the former fruit was of much better quality. Finally, it was found that new wood growth had been retarded by the spray, so that the following crop was almost certain to be affected. The injury seemed to be cumulative, the greatest reduction of crop having occurred where all three applications had been made. But one point stood out clearly: On even the worst injured plats there had been very little actual *burning* of the leaves; instead, the entire plants were affected, as if poisoned.

Possible Reasons for the Decrease

There might be several reasons advanced for the disastrous results of this demonstration. All three applications had been slightly delayed, and apparently the damage increases as the season advances. Except with the first application, the delay had been due to the abnormally wet weather; this condition, of course, might prevail during any season. Moreover, the instruction had not been followed strictly to spray only young growth, preventing the mixture from reaching the fruiting wood or foliage; in practice this seems hard to follow if the young shoots have reached any considerable height. The fact remains that this spray had been applied at least as carefully as the average fruit grower would do it, and that very seri

(*Continued on page* 20)

The Oriental Peach Moth

By Thomas J. Headlee

New Jersey Agricultural Experiment Station

THE ORIENTAL peach moth, which gained entrance into the United States only a relatively few years ago, is now pretty generally distributed throughout the territory east of the Mississippi river, and it has, in some instances, been found west of that river. While it has not yet become a serious pest in all of the fruit growing sections it has entered, it promises to do so in the near future. One year ago this last summer it infested, in some instances, as high as 90 per cent of all the peaches produced in certain orchards. By some investigators, particularly Dr. A. L. Quaintance of the Bureau of Entomology, it is looked upon as bearing much the same relations to the peach as the codling moth does to the apple. It shows, however, much wider variations in number from year to year than does the codling moth. Generally speaking, in an orchard where it is very abundant one year, it is apt to be relatively scarce the year following. Without doubt, this insect was less injurious in New Jersey during the past summer than it was in 1922.

Nature and Extent of Injury

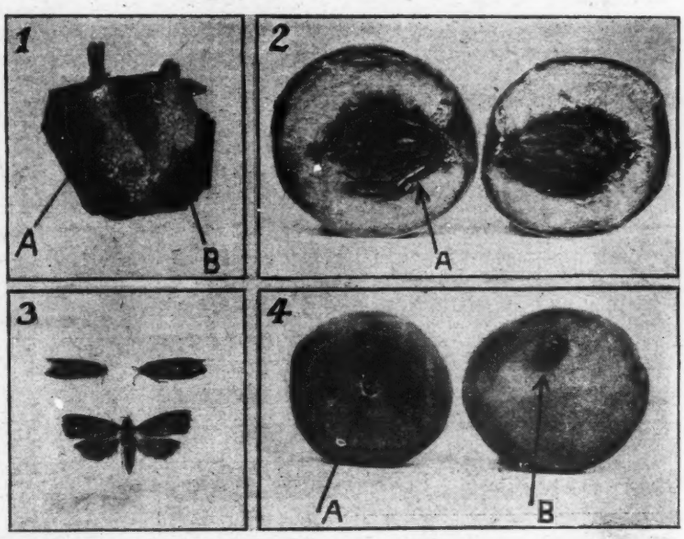
Early in the season when the twig and terminal growth is very soft and succulent, the larvae devote their attention to the terminal shoots, mine them out and destroy them. At this time the fruit is usually small, green and relatively unattractive. When the twig and terminal growth harden, and as the fruit grows larger and more succulent, the worms turn their attention to the fruit. The fruit is entered from any or all directions. Under some conditions, especially late in the season, much injury occurs through the stem of the fruit, and the fruit itself shows no trace of having been injured. Fruit thus infested is frequently shipped into market, without the grower being aware that he is attempting to market wormy peaches.

The injury on the twig is most serious on the young trees, because they are made to grow in a stubby fashion. Shoot injury on old bearing trees is usually of much less importance. Injury to fruit will range from a fraction of one per cent in the early fruit to 25 or 30 per cent in the later fruit. During the season just passed, Fox Seedling showed a higher infestation than Krummel's October, due to the fact, it is believed, that the lowered temperatures during the ripening period of Krummel reduced the activity of the insect. Of course, where the infestation is new, it may range up toward 90 per cent of fruit of late peaches.

Life History and Habits

The Oriental peach moth winters as a larva in a silken cocoon in and under the corky bark of the peach tree, or in a cocoon on or in mummied fruit, or on or in the soil underneath the peach tree. Although accurate figures are lacking, it is thought that the bulk of the over-wintering worms are found on the ground or in mummied peaches. By far the largest part of the worms wintering on the tree are found near the base, and only a small proportion attempt to winter on the tree from a point six or eight inches from the ground to the end of the twigs.

Moths begin to appear in early May. Eggs are laid on the leaves, especially the under-sides. Larvae hatch and make their way into the soft, succulent twigs. A larva may feed in several different twigs. During the season just passed there were three full broods and a pretty large partial fourth brood.



1—Peach moth cocoons. The moth has emerged from cocoon "A," but not from "B."
2—Peach moth injury to fruit. Note larva at "A." 3—Peach moth adults.
4—Peach moth fruit injury. "A" shows stem end injury, "B" side injury (Photos by Peterson)

Control

The application of paradichlorobenzene in the fall, exactly as for peach borer, normally results in the destruction of those larvae which have taken up winter quarters at the base of the tree. Just how far up the tree this killing effect extends is not known, but it is not thought that it goes any higher than the mound. Doubtless, the application of half the dose at the ground level and the other half dose on top of the preliminary mound five or six inches above the ground level, making the mound 12 inches high, would carry the killing effect higher up than would be the case if the entire dose were put at the soil level.

Plowing four inches or more deep, followed by thorough disking to a depth of four inches, thus covering all the soil of the peach orchard, except that which is occupied by the tree trunks, seems to result in a destruction of approximately 100 per cent of the larvae wintering over on the soil or in mummied peaches on the soil. This work should probably be done in April. It is probable that disking in the fall, where the nature of the soil and orchard practice permit, followed by the above treatment in the month of April, would make even more certain a more complete destruction of the ground wintering larvae than could be expected from the April treatment alone.

L. A. Stearns, during his work in Virginia, showed that nicotine could be used as a destructive agent for the eggs of the Oriental peach moth. He

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Citrus Trunk and Root Disease Treatment

By Robert W. Hodgson

University of California

IMPAIRED tree efficiency occasioned by injury from diseases of the trunk and roots constitutes an important source of loss to citrus fruit growers. Orchard inspections frequently show more than 50 per cent of the trees affected by these diseases, and horticultural commissioners and county agricultural agents quite generally agree that approximately one tree in four in citrus orchards is affected by one or more of these diseases. The fact that they are relatively slow in producing serious injury constitutes a serious handicap in their control, as usually by the time the tree indicates distress the disease has reached the point where recovery is difficult or impossible.

While the trunk and root diseases of citrus trees have exacted their tolls for many years, it has not been until comparatively recently that their importance has been sufficiently realized. During the past year, however, provision has been made for the examination and licensing of tree doctors, and for inspection of their work, which clearly indicates that citrus growers are now quite generally familiar with the importance of these diseases and are determined to control them. This recognition has been brought about very largely through the work of county agricultural agents in co-operation with the Citrus Experiment Station, which has for the past 10 years been exhaustively studying these diseases.

It is interesting to note in passing that the only diseases of importance affecting citrus trees in California are those attacking the trunk and roots. In this respect the situation in California is rather different from that in Florida. The reasons for this difference are probably of a climatic character and are believed to be due to the relatively low atmospheric humidity prevalent in California citrus districts and the periodic occurrence of high atmospheric temperatures. At any rate, there are no serious diseases of the fruit and foliage. Only below ground are the moisture and temperature conditions likely to be favorable to the activity of diseases, and this is probably the reason why the only important diseases affecting citrus trees in California are found on the trunk and roots.

The greater prevalence of these troubles in the coastal sections and their occurrence largely on the heavier soil types furnish evidence in support of this conclusion, as well as the facts that they rarely occur on the lighter soils or in the interior section excepting where over-irrigation has been practiced and drainage is poor or where the trees were planted so deeply that the bud unions are partially or entirely buried.

Damage caused by brown rot gum disease to top-worked lemon tree. Cutting out diseased tissue is the first step in treatment

This tree, treated one year before the picture was taken, shows a satisfactory recovery from scaly bark

Brown Rot Gum Disease

The most important of these diseases is that now known as the brown rot gum disease which, so far as can be determined, occurs in every important citrus producing section of the world. Indeed, this disease has exerted a profound influence on the development of the citrus industry the world over. It is said that today practically every citrus tree in Italy is on the sour orange root, and this is due entirely to the fact that this stock is markedly resistant, in fact almost immune, to this disease. Losses from the brown rot gum disease were responsible in large measure for the introduction into Florida at an early date of the sour orange stock and at a later period of its coming into use in California.

It was reported as occurring in the Azores Islands in 1834 and found in Italy in 1863, where it was given the name mal di gomma. It was reported

(*Continued on page 44*)

Spraying Deciduous Fruits in the Southeast

By Oliver I. Snapp, Bureau of Entomology, United States Department of Agriculture

SPRAY PROGRAM FOR PEACHES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or 2% lubricating oil emulsion (see Footnote 1). (When oil emulsion is used, add 4-4-50 Bordeaux mixture for peach leaf curl control in sections where prevalent.)	San Jose and other scale insects and peach leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The 2% lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used, instead of unslaked lime, use 4 lbs. to 50 gals. water.
(3) When calyces or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the petals fall.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(4) Two weeks after the third application, or about 4 weeks after the petals have been shed.	Self-boiled lime-sulphur, 8-8-50, alone. (No arsenate of lead in this application.)	Scab and brown-rot.	If for unavoidable reasons the first spray could not be applied, use the arsenate of lead in this application with the self-boiled lime-sulphur.
(5) Four weeks before each variety is due to ripen.	1 lb. powdered arsenate of lead to 50 gals. 8-8-50 self-boiled lime-sulphur.	Curculio, brown rot, and scab.	This is a very important spray for the second brood of curculio "worms," and must be applied according to the ripening period of each variety. It is, furthermore, the most important application for brown-rot control.

DUSTING PROGRAM FOR PEACHES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or 2% lubricating oil emulsion (see Footnote 1). (When oil emulsion is used add 4-4-50 Bordeaux mixture for peach leaf curl control in sections where prevalent.)	San Jose and other scale insects and peach leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The 2% lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyces or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the falling of the petals.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after the third application or about 4 weeks after the petals have been shed.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Scab and brown-rot.	
(5) Four weeks before each variety is due to ripen.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Curculio, brown-rot, and scab.	

SPRAY PROGRAM FOR PLUMS

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts of water or 2% lubricating oil emulsion (see Footnote 1).	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The 2% lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(3) When calyces or "shucks" are shedding or when small plums are exposed.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(4) Two weeks after the third application.	Self-boiled lime-sulphur, 8-8-50, with ½ lb. calcium caseinate.	Brown-rot and leaf-spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 1½ parts to 50 parts water, should be used instead of self-boiled lime-sulphur.
(5) Four weeks before ripening.	1 lb. powdered arsenate of lead, and ½ lb. calcium caseinate to 50 gals. 8-8-50 self-boiled lime-sulphur.	Curculio, brown-rot, and leaf-spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 1½ parts to 50 parts of water, should be used instead of the self-boiled lime-sulphur.

DUSTING PROGRAM FOR PLUMS

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter.	Lime-sulphur solution, 1 part to 8 parts water, or 2% lubricating oil emulsion (see Footnote 1).	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The 2% lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyces or "shucks" are shedding or when small plums are exposed.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after third application.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Scab and brown-rot.	
(5) Four weeks before ripening.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Curculio, brown-rot, and scab.	

SPRAY PROGRAM FOR SOUR CHERRIES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 to 8, or 2% lubricating oil emulsion.	San Jose and other scale insects.	
(2) When 75% of the petals have fallen.	1 lb. powdered arsenate of lead, lime water from 3 lbs. unslaked lime, and 1½ gals. lime-sulphur concentrate to 50 gals. water.	Curculio and leaf-spot.	Sweet cherries should receive the same materials as noted for the sour varieties, except that the lime-sulphur concentrate should be used in the proportion of 1 gal. to 50 gals. of water.
(3) Three weeks after the shedding of the petals.	1 lb. powdered arsenate of lead, lime water from 3 lbs. unslaked lime, and 1½ gals. lime-sulphur concentrate to 50 gals. water.	Curculio, brown-rot, and leaf-spot.	Sweet cherries should receive the same materials as noted for the sour varieties, except that the lime-sulphur concentrate should be used in the proportion of 1 gal. to 50 gals. of water.
(4) Immediately after fruit is harvested.	1½ gals. lime-sulphur concentrate to 50 gals. water.	Leaf-spot.	Sweet cherries should receive the same material as noted for the sour varieties, except that it should be used in the proportion of 1 gal. to 50 gals. of water.

SPRAY PROGRAM FOR APPLES, PEARS AND QUINCES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or 2% lubricating oil emulsion (see Footnote 1).	San Jose and other scale insects.	In localities where aphids are troublesome this application should be delayed until the green can just be seen in the end of the blossom buds; if aphids are prevalent add ½ pt. 40% nicotine sulphate to 50 gals. water.
(2) Immediately after cluster buds have opened.	1 lb. powdered arsenate of lead and 1½ gals. lime-sulphur concentrate to 50 gals. water.	Curculio, tent caterpillar, scab, etc.	Add nicotine sulphate if aphids are troublesome. This spray may be omitted on varieties not susceptible to scab.
(3) Immediately after the petals fall.	1 lb. powdered arsenate of lead and 1½ gals. lime-sulphur concentrate to 50 gals. water.	Codling moth, curculio, leaf-roller, tent caterpillar, scab, etc.	This is the most important application for the codling moth, and the spray should be driven well into the calyx end of the small apples. Avoid over-spraying.
(4) Two to 3 weeks after petals fall.	1 lb. powdered arsenate of lead to 50 gals. 3-4-50 Bordeaux mixture.	Codling moth, leaf-roller, scab, leaf-spot, blotch, etc.	
(5) Three weeks after fourth application.	1 lb. powdered arsenate of lead to 50 gals. 3-4-50 Bordeaux mixture.	Codling moth, blotch, bitter and black rots.	
(6) Two to 3 weeks after fifth application.	1 lb. powdered arsenate of lead to 50 gals. 4-4-50 Bordeaux mixture.	Codling moth, bitter and black rots, and blotch.	
(7) One month before each variety is due to ripen.	1 lb. powdered arsenate of lead to 50 gals. 4-4-50 Bordeaux mixture.	Codling moth, and bitter-rot.	If bitter-rot is severe, an additional application of Bordeaux mixture should be made between sixth and seventh applications at 2 to 3 week intervals.

Note—Summer apples usually need only the first, second, third and fourth applications of the above spray program; however, the latest ripening summer varieties may need the fifth and sixth. Pears and quinces usually require only applications 1, 3, 4 and 6, and Bordeaux mixture may be used in place of the lime-sulphur on these fruits.

SPRAY PROGRAM FOR GRAPES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when vines are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or 2% lubricating oil emulsion (see Footnote 1).	Scale insects.	
(2) Just before blossoms open.	1½ lbs. powdered arsenate of lead to 50 gals. 4-3-50 Bordeaux mixture.	Flea-beetles, rose-chafers, anthracnose, black-rot, and mildew.	
(3) After blossoms fall.	1½ lbs. powdered arsenate of lead to 50 gals. 4-3-50 Bordeaux mixture.	Flea-beetles, rose-chafers, grape leaf-folders, anthracnose, black-rot, and mildew.	
(4) Two weeks later.	1½ lbs. powdered arsenate of lead, ¼ pt. nicotine sulphate, and ½ lb. calcium caseinate, to 50 gals. 4-3-50 Bordeaux mixture.	Leaf-hoppers, aphids, leaf-folders, and fungous diseases.	
(5) Two weeks before fruit is due to ripen.	1 lb. neutral copper sulphate or basic acetate copper, and ½ lb. calcium caseinate to 50 gals. water.	Black-rot, and mildew.	

SPRAY PROGRAM FOR BLACKBERRIES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During late winter just before growth starts.	1 gal. lime-sulphur concentrate to 8 parts water.	Scale insects and anthracnose.	
(2) When new shoots are 6 ins. high.	1 gal. lime-sulphur concentrate to 40 gals. water.	Anthracnose.	Add arsenate of lead, 1 lb. to 50 gals. water if chewing insects are troublesome.
(3) When new shoots are 10 ins. high.	1 gal. lime-sulphur concentrate to 40 gals. of water.	Anthracnose.	Add arsenate of lead in proportion 1 lb. of the powder to 50 gals. of water if chewing insects are troublesome.
(4) Just before blooms open.	1 gal. lime-sulphur concentrate to 40 gals. water.	Anthracnose.	Add arsenate of lead, 1 lb. to 50 gals. water, if chewing insects are troublesome.

SPRAY PROGRAM FOR STRAWBERRIES

Time of Application.	Material to Use.	For Control of	Remarks.
(1) Just before blossoms open.	4-4-50 Bordeaux mixture.	Leaf-spot.	
(2) After blossoms open.	4-4-50 Bordeaux mixture.	Leaf-spot.	Add 1 lb. powdered arsenate of lead to 50 gals. of spray if leaf rollers or flea beetles are present.
(3) Two weeks later.	4-4-50 Bordeaux mixture.	Leaf-spot.	Add 1 lb. powdered arsenate of lead to 50 gals. of spray if leaf rollers or flea beetles are present.

Footnote 1—The stock lubricating oil emulsion usually contains 66⅔% of oil. Add 6 gals. of this stock emulsion to 194 gals. water to make a 2% emulsion.

Recommendations for disease control in above schedules furnished by the Office of Fruit Disease Investigations, Bureau of Plant Industry, United States Department of Agriculture.

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The February Issue

THE SPRAYING question is again before fruit growers, and in keeping with our policy, we have again devoted the February issue entirely to spraying and related subjects. We have planned this issue very carefully and have spared no time or expense in selecting and preparing the material. We hope the issue will please you.

The issue contains leading articles on some of the outstanding subjects from a spraying standpoint. These are written by some of the best authorities in the country. In addition, we are including spray calendars, as usual, for every important fruit section and for all of the leading fruits.

The building up of a spray issue is the product of years of hard work. So far as we know, the spray calendar idea was first presented through the American Fruit Grower Magazine about 1918, when we printed a spray calendar prepared by Dr. A. S. Colby, of the University of Illinois. The idea proved popular because it presented in a simple and practicable fashion directions for treating insects and diseases. The idea has been generally adopted and now even experiment stations are presenting spray calendars in their official publications. We have extended the use of the spray calendar and now we are presenting calendars for every important fruit section.

It is our policy to have the same authors prepare the calendars for their sections year after year, for in this way we are able to secure the advantages of a consistent consecutive program for our readers. Most of the calendars in this issue were prepared by the same men as in 1924. Prof. Leroy Childs, of Oregon, has co-operated with Prof. H. P. Barss in preparing the Northwest calendar this year, following the death of Prof. A. L. Lovett. Prof. Laval S. Morris, of Utah, has prepared the calendar for the Rocky Mountain section because of the absence of Prof. M. C. Merrill. Prof. G. S. Ralston, of Virginia, resigned during the year, and the calendar for that section was furnished by Prof. F. A. Motz. No calendars were included last year for New York, for southeastern deciduous fruits, or for the Southwest; we are pleased this year to present calendars for these sections prepared, respectively, by pathologists and entomologists of New York, by Prof. Oliver I. Snapp of the United States Department of Agriculture, and by Prof. A. T. Potts of Texas.

With these additions, we believe we have rounded out our plan to include spraying programs for all of the important fruits in every important fruit section of the United States. We believe the February issue contains the most comprehensive lot of spraying information ever assembled in one publication.

Our Advisory Committee

OUR ADVISORY Committee has now served about a year, and it seems worth while to comment on the results. The proposition has worked out very nicely. We have received fine co-operation from the members of the board, and we feel this has benefited readers in the form of a better magazine.

We have tried not to bother the Advisory Committee members unduly. We have written them as a whole only a few times, when we wanted their opinion on some matters of general importance. At other times we have written various ones of them individually, as, for instance, when we wanted their opinion about some matter that affected their locality in particular, or when we wished their advice as to what kind of subject matter would best serve the interests of growers in their section, or when we wanted advice from them as to authors, articles, etc. While each member may not feel that he has rendered a great deal of assistance, the combined result has been very much worth while.

We take this opportunity to extend our thanks, before our readers, for the excellent co-operation the Advisory Committee members have given. This thanks is all the more deserved because all the members are serving without any pay whatever. In other words, they are under no obligation to the magazine in any way. The Editor did succeed in getting a few of these men together for an evening meal at a meeting in Washington recently, but even then he had a hard time in getting them to let him pay the bill. The Advisory Committee members have served on the board simply because of a desire to be of service to the industry, and we feel that because of this, our readers, as well as us, should be thankful to them.

A Matter to Think About

WITH the opening of the new year, the legislatures of a large number of states have gone into session. It is reported that 38 states will consider the ratification of the proposed child labor amendment. Within the next month or so the fate of the amendment should be known.

In 1920 there were 13,502,582 children in the country between 10 and 15 years of age. Of these 1,060,858 were gainfully employed, and 647,309 of these, or 61 per cent of those working, were engaged in farm pursuits. The amendment, therefore, would apply in a larger way to agriculture and horticulture than to all other branches of industry combined. There are certain features in this connection which deserve careful thought, not only by fruit growers and farmers but by every American citizen.

The American farm home has been a powerful factor in the life of the nation. In times of great crises it has always proved itself the bulwark of the nation. During periods of economic and financial difficulties the conservative thinking and methods of the farm folks have served as a stabilizing influence to the entire country. In times of war the farm homes have supplied able men in great numbers, and they have supplied large quantities of food; in fact, if the history of the recent war is ever written in accordance with the facts, it will give American farmers a large share of the credit for the allied victory because of the quantities of food they supplied.

In industry and business the farm homes have also contributed their part. When a corporation needs a man or woman for a real hard job, it is pretty likely to select one whose early training was received on the farm, for it has been learned by experience that in some way or another such folks are able to put hard jobs across better on the average than men or women who have spent their entire lives in the cities. A majority of the leading men in public life have been furnished by the farms. Politicians, realizing the esteem in which farm-reared folks are held, commonly contrive in one way or another to connect their early training with the farm.

The record of the American farm home in furnishing good men and women shows that its method of raising children is about right. An institution which has such a successful record should not, in our opinion, be tampered with. It may be possible to improve its methods, but there are so many chances that the situation will be injured instead of improved that we believe matters should be left as they are. There are times when it is simply good sense to "let good enough alone," and we believe this is one of them.

The proposed child labor amendment, in our opinion, threatens to invade the sanctity of the American farm home, which always has been, and still is, one of the most dependable elements in our national welfare. We believe it is only wise American policy that the amendment should be voted down in its present form.

Read the Ads, Too

YOU WOULD be surprised if you knew how many inquiries we receive asking about materials and appliances that are advertised regularly in the magazine. We know positively that a great many of our readers look over the ads as well as the articles, for advertisers in general say they get excellent results from advertisements in the American Fruit Grower Magazine. But it is quite clear that some of our readers do not pay much attention to the ads.

Of course, you will receive a lot of help if you read the articles, but you will not reap the full benefit of your subscription unless you look over the advertisements also. Our reading matter is devoted to principles and methods. In the interest of our readers, we aim to keep the reading matter free from propaganda of all kinds. We cannot under any circumstances recommend the products of any particular company in our reading columns. We feel that advertisers should present their own products through the advertising columns.

It can be seen, therefore, that if you want the whole story you must read the advertisements as well as the articles. There are constant changes taking place in materials and appliances for fruit growing, as well as in methods and principles. It is only through the advertisements that you can keep in touch with these developments. You may think you do not need any materials or appliances, but if you will look over the advertising columns, the chances are good that you will find something you want. At any rate, you will know what is going on in the industry, and that is information which is important to every progressive fruit grower. If you are interested in good literature, you should also read the advertisements, for many of the ads are prepared by high-class experts and are really good literature.

Our advice, therefore, is that you read the advertisements as well as the articles if you want the whole story.

Spray Calendar for Virginia

Prepared by the Departments of Horticulture, Plant Pathology and Entomology

APPLES

DISCUSSION OF SPRAY CALENDAR FOR APPLES

Since apple growing is the most important branch of the Virginia fruit industry, the apple spray calendar is of the most importance. The Virginia Spray Service applies only to the apple calendar, therefore every apple grower should familiarize himself with the name, the number and materials used for every spray, and the specific diseases and insect pests to be controlled.

The following discussion is presented for the purpose of informing the growers of the materials used, the purpose of each spray and the factors governing the timing of these sprays.

Spray No. 1 (Delayed Dormant)—This spray should be applied in every orchard. Application should be most thorough in order to destroy every aphis egg or aphis and scale on the tree. The eggs are usually found under the edge of loose bark or in depressions in the bud where they are protected. Unless they are actually covered by the spray material they will not be killed. Whenever scale is found under the large pieces of bark on the trunk of a tree, this bark should be removed before spraying.

Sprays Nos. 2 and 3 (Pink and Calyx)—The pink and calyx sprays are the most important sprays for scab, leaf spot and codling moth. The calyx spray is the most important single spray in the apple spray calendar because it is an important scab spray and the most important codling moth spray. Both the pink and the calyx sprays are absolutely essential for scab control because they are applied when the first infections occur.

Spray No. 4 (Ten-day)—It is definitely known that this spray cannot be omitted on scabby varieties and those susceptible to leaf spot (frog-eye). This spray may be omitted on non-scabby varieties like York Imperial and Grimes where leaf spot has not been prevalent in previous years.

Spray No. 5 (Four-week)—This spray must be applied in every orchard as specified in the calendar because it is primarily a codling moth spray, and this insect attacks every variety.

Spray No. 6 (Seven-week)—Where bitter rot and cloud are prevalent, this spray is of great importance. In orchards free from bitter rot, this spray may be omitted but it should always be applied to Pippins.

Spray No. 7 (Ten-week)—This spray must be applied in every orchard as recommended in the calendar. In the Winchester section an additional spray is necessary in August to control the leaf roller. The time for applying this spray will be given by the Spray Service. The leaf roller is very difficult to control because of its habits. It is necessary to apply a lead arsenate spray made of 6 lbs. of lead for each 100 gals. of water to which 20 lbs. of slaked stone lime is added.

No. and Name of Spray.	Parasites.	Time of Application.	Materials to Use.	Remarks.
(1) Delayed dormant.	Scale and aphis.	When green can first be seen in tips of blossom buds. Read Footnote 1 carefully.	Standard strength lime-sulphur (see Footnote 2), 1 to 8 or its equivalent of other strength solutions. Add ¾ pt. nicotine sulphate to 100 gals. If scale is serious, substitute Scalecide or the government lubricating oil emulsion for lime-sulphur.	If the orchard is badly infested with scale, apply one of the oil sprays in February or early March; then apply the delayed dormant spray at the regular time, using lime-sulphur and nicotine. Read Footnote 1 carefully.
(2) Pink spray.	Scab and mildew.	Begin when pink shows plainly in blossom buds.	Lime-sulphur, 5 qts. to 50 gals. water.	Spray all varieties except York and Grimes; spray these varieties also if they were infected with scab or mildew the preceding year.
(3) Calyx spray.	Codling moth, leaf roller, curculio, tent caterpillar, scab, mildew.	When petals are ⅞ fallen.	Standard strength lime-sulphur, 5 qts. to 50 gals. water. To each 50 gals. of solution, add 1½ lbs. powdered lead arsenate. Mix the lead with lime water before adding to the tank.	This spray is very important in the control of codling moth and scab.
(4) Ten-day spray.	Frog eye, scab, mildew, blotch.	Ten days after Calyx spray.	Same as in Spray No. 2.	The most effective frog eye spray and important for scab control. If these diseases are not prevalent on York and Grimes, the spray may be omitted on these varieties.
(5) Four-week spray.	Leaf roller, codling moth, scab, bitter and black rots, blotch and cloud.	Apply 4 weeks after the calyx spray. It is important that this spray be completed on Pippins by June 5. Spray Pippins first, then the other varieties.	Bordeaux 3-5-50 on Pippin or other rot susceptible varieties. Add 1½ lbs. powdered lead arsenate to 50 gals.	This spray is applied when the first codling moth larvae are hatching. Without it neither codling moth nor bitter rot can be controlled. Bordeaux rather than lime-sulphur should be used, since it is more effective and less apt to burn.
(6) Seven-week spray.	Bitter and black rots, cloud and blotch.	Seven weeks after the calyx spray.	Bordeaux mixture, 4-5-50.	Apply in Pippin and other rot susceptible orchards; also wherever rot, cloud or blotch was prevalent the preceding season.
(7) Ten-week spray.	Codling moth, leaf roller, bitter and black rots, cloud.	Ten weeks after the calyx or 3 weeks after the seven-week spray.	Bordeaux mixture, 3-5-50, except in Pippin or other rot susceptible orchards, where the 4-5-50 formula should be used. Add 1½ lbs. powdered lead arsenate to 50 gals.	This spray is recommended just before the period when the codling moth larvae of the second brood hatch in greatest numbers. It is also necessary for leaf roller control.

Footnote 1—Experiments indicate that lubricating oil emulsion will not control apple aphis in the cracked egg stage. If treatment is delayed until eggs are hatched, the oil emulsion, combined with nicotine, is effective. However, lime-sulphur applied during the cracked egg stage is very effective in destroying the eggs prior to hatching, but after the eggs have hatched, lime-sulphur will not give control; nicotine must be added to it at this stage. The date of the cracked egg stage of the aphis eggs will be sent to the growers through the Spray Service. The cracked egg stage usually lasts over a 2 weeks' period.

Spray Service—Information as to actual time of application of sprays Nos. 5 and 7 will be sent to Virginia growers through the spray service channels. This information will be secured by field entomologists and will be disseminated through the office of the county agents or through the office of local fruit growers' organizations. In addition, attention will be called to the other sprays prior to time of application.

Footnote 2—In this calendar, the recommendations for the use of lime-sulphur solution are all based on a solution testing 32 degrees Baume. It is suggested that the strength of lime-sulphur be tested both in the concentrated and dilute forms. This will guard against mistakes and may prevent loss from insufficient strength or from burning.

PEACHES

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season (before buds have commenced to swell), February or early March.	Standard strength lime-sulphur, diluted 1 to 8.	Scale, leaf curl.
(2) Immediately after the petals drop.	1 lb. powdered lead arsenate to 50 gals. water; add 3 lbs. freshly slaked lime to each 50 gals.	Curculio.
(3) One week after No. 2.	Self-boiled lime and sulphur or dry mix. Add 1 lb. powdered lead arsenate to each 50 gals.	Curculio, scab, brown rot.
(4) Three weeks after No. 3.	Same as in No. 3. If curculio have not been injurious, omit the lead arsenate.	Curculio, scab, brown rot.
(5) One month before fruit ripens.	Self-boiled lime and sulphur or dry mix.	Scab, brown rot.
(6) For late varieties only; 3 weeks after No. 5.	Same as in No. 5.	Brown rot.

In the northern part of the state and in orchards which suffer from early infection of brown rot, resulting in blighting of the blossoms and drying up and dropping of the small fruit, apply same treatment as in spray No. 3 when pink begins to show in the bud, and give similar treatment in spray No. 2 in place of the treatment prescribed above under No. 2. Spray No. 1 and the pink spray are two separate and distinct sprays and cannot be combined. No. 1 must be applied while the trees are absolutely dormant and before the bud scales begin to separate if leaf curl is to be controlled, and the pink spray must go on before the petal spray. Early infection of brown rot is not prevalent generally over the state, but is reported from sections of northern Virginia, particularly in Loudoun county. Unless it is known to prevail, treat peaches as recommended in the calendar.

If rose chafer should become serious and threaten the loss of the crop, spray with arsenate of lead, 4 lbs. to 50 gals., to which 1 gal. of molasses is added. Application should be made when the bugs appear. Do not use this spray unless absolutely necessary to save the crop.

CHERRIES

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season.	Lime-sulphur, standard strength, diluted 1 in 8.	Scale.
(2) Immediately after petals fall.	Standard strength lime-sulphur. Sour cherry, diluted 6 qts. to 50 gals. Sweet cherry, diluted 5 qts. to 50 gals. Add 1 lb. lead arsenate to each 50 gals.	Leaf spot, curculio.
(3) One week after No. 2.	Same as in No. 2.	Leaf spot, curculio.
(4) Three weeks after No. 3.	Same as in No. 2.	Leaf spot, curculio, brown rot.
(5) Immediately after fruit is harvested.	Same as in No. 2 but omit the lead arsenate.	Leaf spot.

If rose bug should become serious, apply same treatment as recommended for peaches.

PLUMS

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season.	Standard strength lime-sulphur, diluted 1 in 8.	Scale and general clean-up.
(2) As soon as petals fall.	Standard strength lime-sulphur, 6 qts. to 50 gals. water; add 1 lb. powdered lead arsenate to each 50 gals. solution.	Curculio, leaf spot.
(3) One week after No. 2.	Same as in No. 2.	Curculio, leaf spot.
(4) Three weeks after No. 3.	Same as in No. 2.	Curculio, leaf spot.
(5) One month before fruit ripens.	Self-boiled lime and sulphur.	Brown rot and other fungous diseases.

GRAPES

No. and Time of Application.	Materials to Use.	Pest.
(1) Dormant season.	Lime-sulphur, 32 degrees strength, diluted 1 in 8.	Scale and general clean-up.
(2) When second or third leaf shows.	Bordeaux, 4-5-50.	Anthracnose, bitter rot, black rot, mildew.
(3) Before blossoms open.	Bordeaux, 4-5-50.	Anthracnose, bitter rot, black rot, mildew.
(4) After blossoms fall.	Bordeaux, 4-5-50.	Anthracnose, bitter rot, black rot, mildew.
(5) Ten to 14 days later.	Bordeaux, 4-5-50.	Anthracnose, bitter rot, black rot, mildew.
Then after at 2 week intervals until within 2 weeks of harvest time.		

Lead arsenate, 2 lbs. powder to each 50 gals. of solution, should be combined with Bordeaux if chewing insects make an appearance.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloring of the fruit. The following formula is suggested:

Caustic soda	5 lbs.
Copper sulphate	4 lbs.
Water	50 gals.

Prepare and apply same as Bordeaux.

RASPBERRIES AND BLACKBERRIES

Anthracnose causes canker on the canes of the raspberry and blackberry. It is the most important disease of the bush fruits in Virginia and can be effectively controlled by the application of two lime-sulphur sprays according to the following calendar. The addition of a casein spreader at the rate of ½ lb. to 50 gals. of spray material is very advisable.

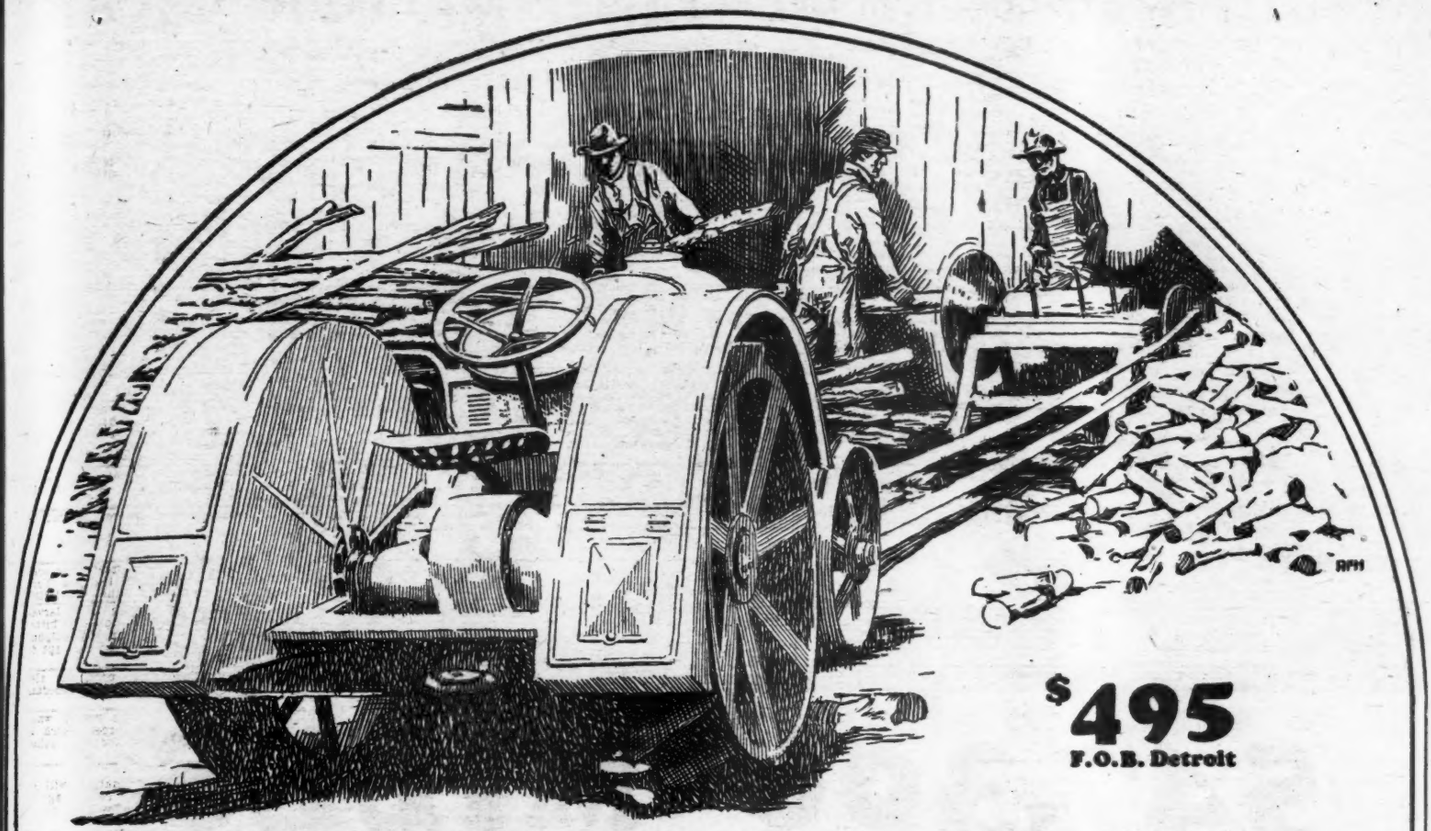
No. and Time of Application.	Materials to Use.	Pest.
(1) In spring just after growth begins.*	5½ gals. commercial lime-sulphur in 50 gals. water.	Anthracnose.
(2) One week before bloom.	1 gal. commercial lime-sulphur in 50 gals. water.	Anthracnose.

*Spray No. 1 should be applied after growth begins but not after the leaves have reached ½ in. in length.

STRAWBERRIES

No. and Time of Application.	Materials to Use.	Pest.
(1) When growth begins.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(2) Before blossoming.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(3) Just after blossoming.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(4) After leaves have been mowed and burned.	Bordeaux mixture plus 1 lb. lead arsenate to each 50 gals. Bordeaux.	Leaf spot, flea beetle.

Should leaf roller appear, or if it has been prevalent, add lead arsenate at rate recommended in No. 4 spray in each application.



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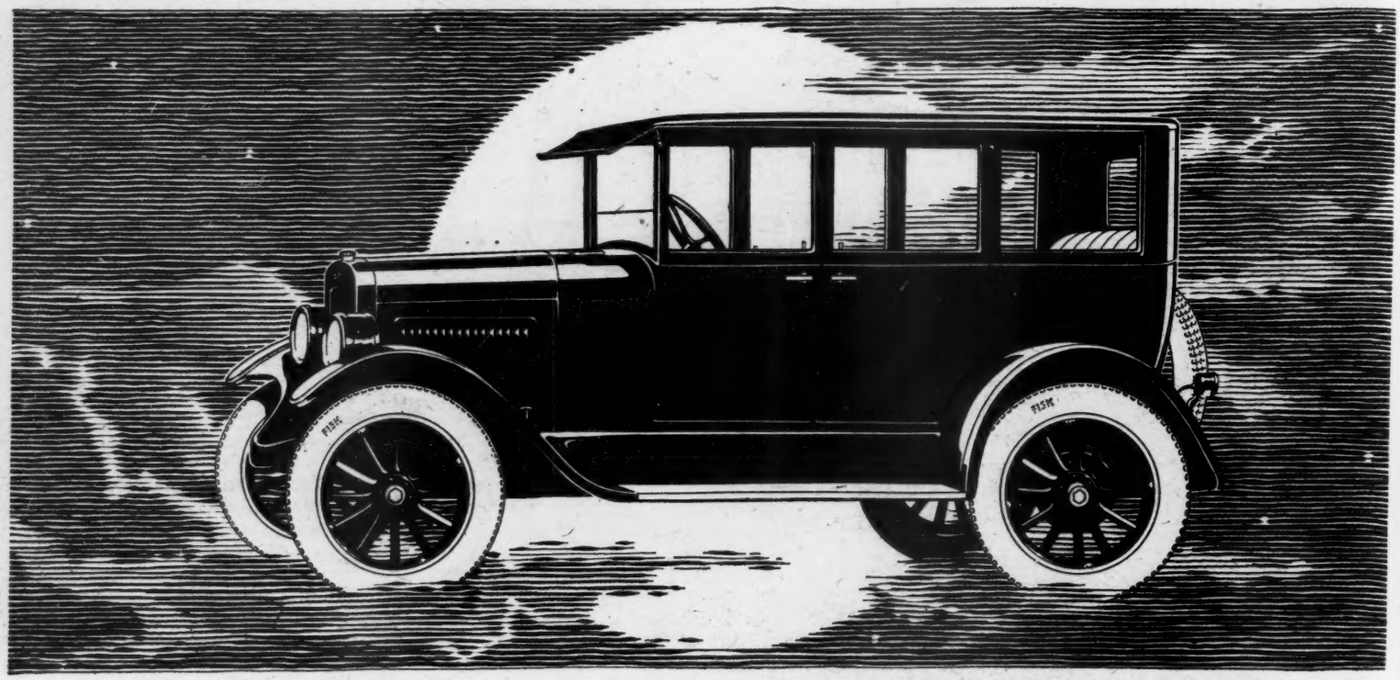

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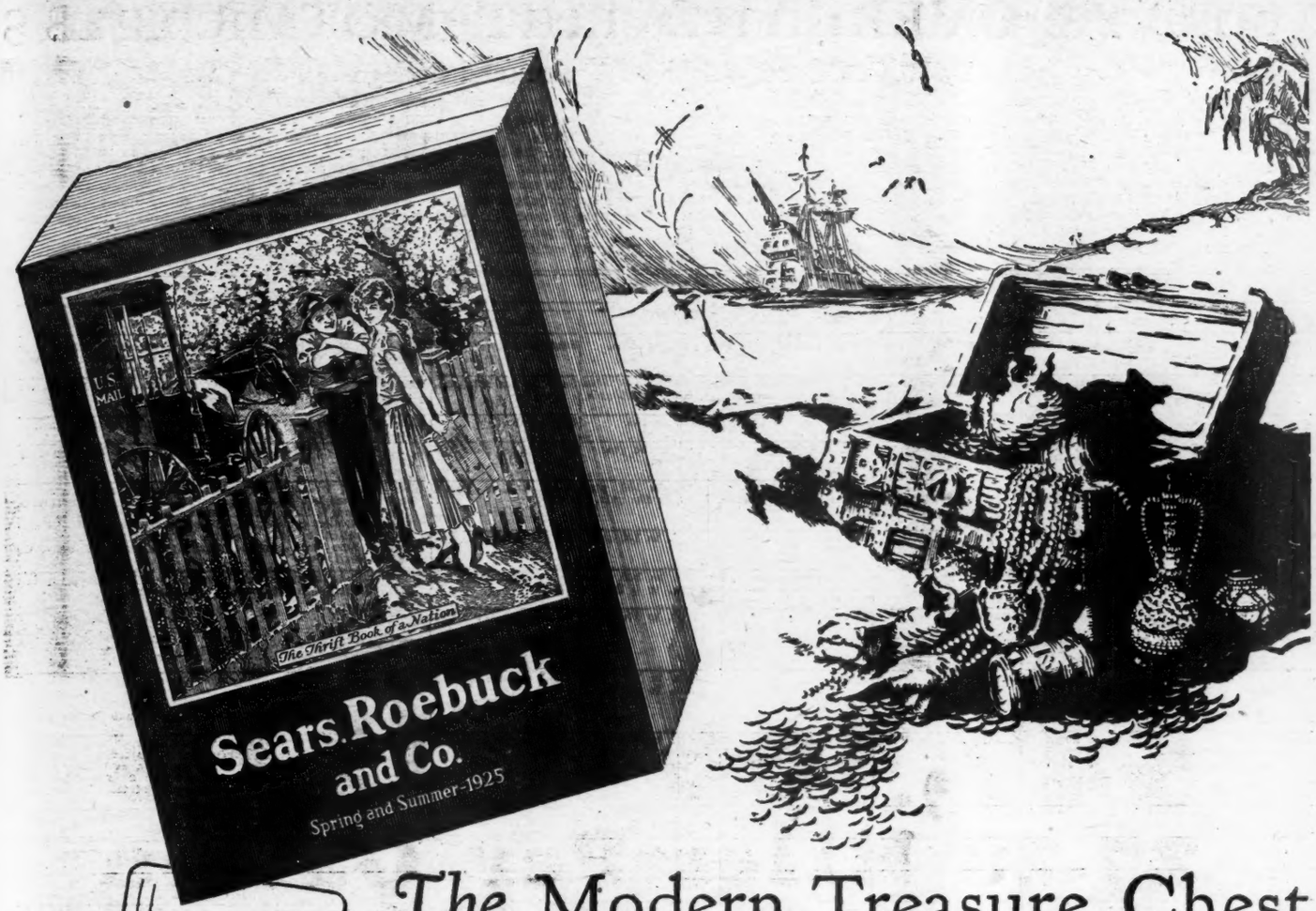

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Spraying and Dusting Schedules for Michigan

By W. C. Dutton, Michigan Agricultural College

In these schedules, recommendations are made for spraying and for dusting. The value of the spraying materials recommended has been well established in every instance, and satisfactory control may be expected if the materials are used at the proper strength, properly mixed, and applied thoroughly at the correct time. The value of dusts under Michigan conditions has been well established for certain uses, but with some fruits the results have not been consistently satisfactory in seasons which were very favorable for the development of diseases and insects. Complete dusting schedules are given, however, wherever possible to guide the growers who care to use this method of application. Some growers use a combination of both methods. The usual procedure in such cases is to spray for all applications before the blossoming period and to dust for all or part of them after the blossoming period. Dusting may also be used to advantage as an auxiliary to spraying to cover the orchard quickly under emergency conditions or to dust when conditions are not favorable for spraying applications. In some sections and with certain varieties all the applications indicated may not be required. Make changes only when infestation is light or with resistant varieties.

APPLES

Application.	To Control.	Materials — Spraying.	Materials — Dusting.	Remarks.
Dormant. Apply as late as possible before growth starts; or—	Scale insects.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	There are certain proprietary sulphur sprays which usually give satisfactory results if used strong enough. Use this application when scale insects only are present.
Delayed dormant. Begin when the fruit buds show silvery and finish when they are in the "squirrel's ear" stage.	Aphids and scale insects.	Liquid lime-sulphur, 12½ gals. in 100, plus nicotine sulphate (40%), 1 pt. in 100 gals.	Same as for spraying.	This is the safest method of attack on aphids and will at the same time control scale if present.
Prepink. Should start soon after "squirrel's ear" stage but should be finished when the buds show in a compact cluster and with leaves turned back from them, but before any separation occurs.	Scab.	Liquid lime-sulphur, 2½ gals. in 100.	Sulphur dust.	This application is very important with most varieties and is specially desirable with the dusts.
	Bud-moth.	Lead arsenate powder, 2 lbs. in 100 gals.	Or 90-10 sulphur-lead dust.	If bud-moth is present use lead arsenate in either the spray or dust.
Pink. Apply as soon as possible after the buds separate in the cluster but before any blossoms open.	Scab, green fruit worm, cankerworm and other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 lbs. in 100 gals.	90-10 sulphur-lead dust.	With dusting treatment, an extra application of sulphur dust should be made between the prepink and pink in seasons when development is slow during that period. If aphids have not been controlled completely, use nicotine. Red bug will also be controlled by the nicotine. An extra application of nicotine-lime dust may be made in addition to the 90-10 sulphur-lead dust.
	Aphids, red-bug.	Nicotine sulphate (40%), 1 pt. in 100 gals.	Sulphur-lead-nicotine dust.	
Calyx. Apply as soon as most of petals are off.	Scab, codling moth, other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 lbs. to 3 lbs. in 100.	90-10 sulphur-lead dust.	This should be completed as soon as possible after the petals fall. If red-bugs are present, use nicotine.
	Red-bug.	Nicotine sulphate (40%), 1 pt. in 100 gals.	Sulphur-lead-nicotine dust or separate application of sulphur-lead and nicotine-lime dusts.	
Ten days or two weeks. Should be completed in 2 weeks after petal-fall.	Scab, codling moth, other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 lbs. to 3 lbs. in 100 gals.	90-10 sulphur-lead dust.	For spraying, this may be delayed 1 to 2 weeks if scab control has been completed earlier; otherwise, begin on tenth day. With dusting, this application should be split. Dust one side of trees 1 week after petal-fall and complete at 2 weeks.
Thirty days. Should be complete about 30 days after petal-fall.	Codling moth, scab.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 3 lbs. in 100 gals.	85-15 sulphur-lead dust.	If the previous spray application has been delayed this may be omitted; otherwise, it is desirable for codling moth control. The dust application should be split, as before, dusting one side at about 3 weeks and completing at 30 days. The first half should be made on same side of trees as first half of previous dusting.
Second brood. Exact time to be determined. Usually about first week in August.	Codling moth, scab.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 3 lbs. in 100 gals.	85-15 sulphur-lead dust.	The exact time for this application is determined each year by the Experiment Station Entomologist.

PEARS

Application.	To Control.	Materials — Spraying.	Materials — Dusting.	Remarks.
(1) Dormant. Apply just as the buds begin to swell; or—	Scale insects and blister-mite.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	This application may be used when scab and psylla are not present.
(1-a) Delayed dormant. Apply after the buds can be seen in the cluster, but must be completed by the time they begin to separate.	Psylla, scab, scale insects and blister-mite.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	This application is very important for the control of scab and at the same time will control scale and blister-mite.
(2) Pink (cluster stage). Apply as soon as possible after the buds separate but before the blossoms open.	Scab.	Bordeaux 4-8-100.	Sulphur dust.	This is necessary only in districts where scab is prevalent or on varieties that are always susceptible to scab.
(3) Calyx (petal-fall). Apply just after the petals have fallen.	Psylla, scab, codling moth.	Bordeaux, 4-8-100, plus lead-arsenate powder, 2 lbs. in 100 gals., plus nicotine sulphate (40%), 1 pt. in 100 gals.	90-10 sulphur-lead dust and nicotine-lime dust (2% to 3% nicotine).	A very important application for the control of psylla. When dusting, the nicotine application must be delayed for 7 to 9 days and made separately. Nicotine dusts do not seem to be as certain a control for psylla as proper spraying but have given fairly satisfactory results in some parts of the country.
(4) Two weeks. Apply 2 weeks after the petals have fallen.	Psylla, scab, codling moth.	Bordeaux, 2-8-100, plus lead arsenate powder, 2 lbs. in 100 gals., plus nicotine sulphate (40%), 1 pt. in 100 gals.	90-10 sulphur-lead dust and nicotine-lime dust (2% to 3% nicotine).	The nicotine dust must again be delayed until about 2 weeks after the first application of nicotine dust. If necessary to spray for scab and worms only, the nicotine should be omitted from both dust and spray.

SPECIAL NOTE—The spraying or dusting requirements for pears vary widely in different parts of the state. Each grower must spray according to local conditions. The following lists will serve as a guide:

1. If necessary to spray for **scale and blister-mite** only, use application No. 1.

2. If necessary to spray for **scab** alone, or in addition to scale and blister-mite, use applications Nos. 1a, 2, 3 and 4, but omit nicotine.

3. If necessary to spray for **scab and psylla alone, or in addition to scale and blister-mite**, use applications Nos. 1a, 2, 3, and 4. Use all materials indicated.

4. If necessary to spray for **psylla** alone, or in addition to scale and blister-mite, use applications Nos. 1a, 3 and 4. For this schedule (when scab is not present) the strength of the Bordeaux may be reduced to 2-8-100 for both Nos. 3 and 4. When spraying for psylla, very thorough application is necessary. Spray from the ground. Use a fine driving spray with high pressure. Cover every portion of the tree. For the summer applications, spray up through the center clear to the top, drenching every leaf, stem, fruit and bud.

PEACHES

Applications.	To Control.	Materials — Spraying.	Materials — Dusting.	Remarks.
Dormant. Apply in early spring before buds begin to swell.	Leaf-curl, scale.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying	This application must be made before growth starts in the spring. A fall application made after the leaves drop is generally effective in the control of leaf-curl.
After the blossoms have dropped and most of the "shucks" have fallen.	Curculio.	Lead arsenate powder, 2 lbs. in 100 gals., plus 2 lbs. to 3 lbs. lime (lump or hydrated).	Lead arsenate — hydrated lime dust (10% lead arsenate).	This application may be omitted if curculio is not serious.
Two weeks after the "shucks" have fallen.	Curculio, scab, brown-rot.	Dry-mix sulphur-lime spray, plus lead arsenate powder, 2 lbs. in 100 gals.	80-10-10, sulphur-lead-lime dust.	This is more necessary in areas where rot or scab are likely to develop.
About one month before the fruit ripens.	Brown-rot, scab, curculio.	Dry-mix sulphate-lime spray plus lead arsenate powder, 2 lbs. in 100 gals.	60-10-10, sulphur-lead-lime dust or sulphur dust.	This is important where brown-rot or scab are likely to develop. If curculio is not serious, the poison may be omitted.
One week to 10 days before fruit is picked.	Brown-rot.	Sulphur-casein spray (16 lbs. sulphur, 1 lb. calcium caseinate. Mix dry, add water to make thin paste and dilute to 100 gals.)	Sulphur dust.	This application is very important with many varieties to retard the development of rot after picking and packing.

(*Concluded on page* 14)

Peach Growers Should Not Neglect Scale Spraying

THE 1924 season has been one of the most favorable for the propagation of the San Jose scale in Georgia peach orchards. Gravid females and young scale are more or less abundant in all orchards that have not yet received the dormant spray, and growers are urged to take advantage of the first period of favorable weather for the scale spraying. At the present time perhaps three-fourths of the acreage in the peach belt is yet to be sprayed.

On account of the great prolificacy of the San Jose scale, a delay in applying the dormant spray or the omission of the annual treatment may prove very costly. The progeny from one parent in the South during a year may reach two billion scales. In this latitude female scales may give birth to young during warm periods of each of the winter months, as well as continuously reproduce young during the summer months.

Every peach tree in the Georgia peach belt should receive an application of either liquid lime-sulphur in the proportion of one part of the concentrate to eight parts of water, or lubricating oil emulsion at the rate of six gallons of the stock emulsion containing 66⅔ per cent of oil to 194 gallons of water during the dormant season before the buds burst.—*Government and State Lab., Fort Valley, Ga.*

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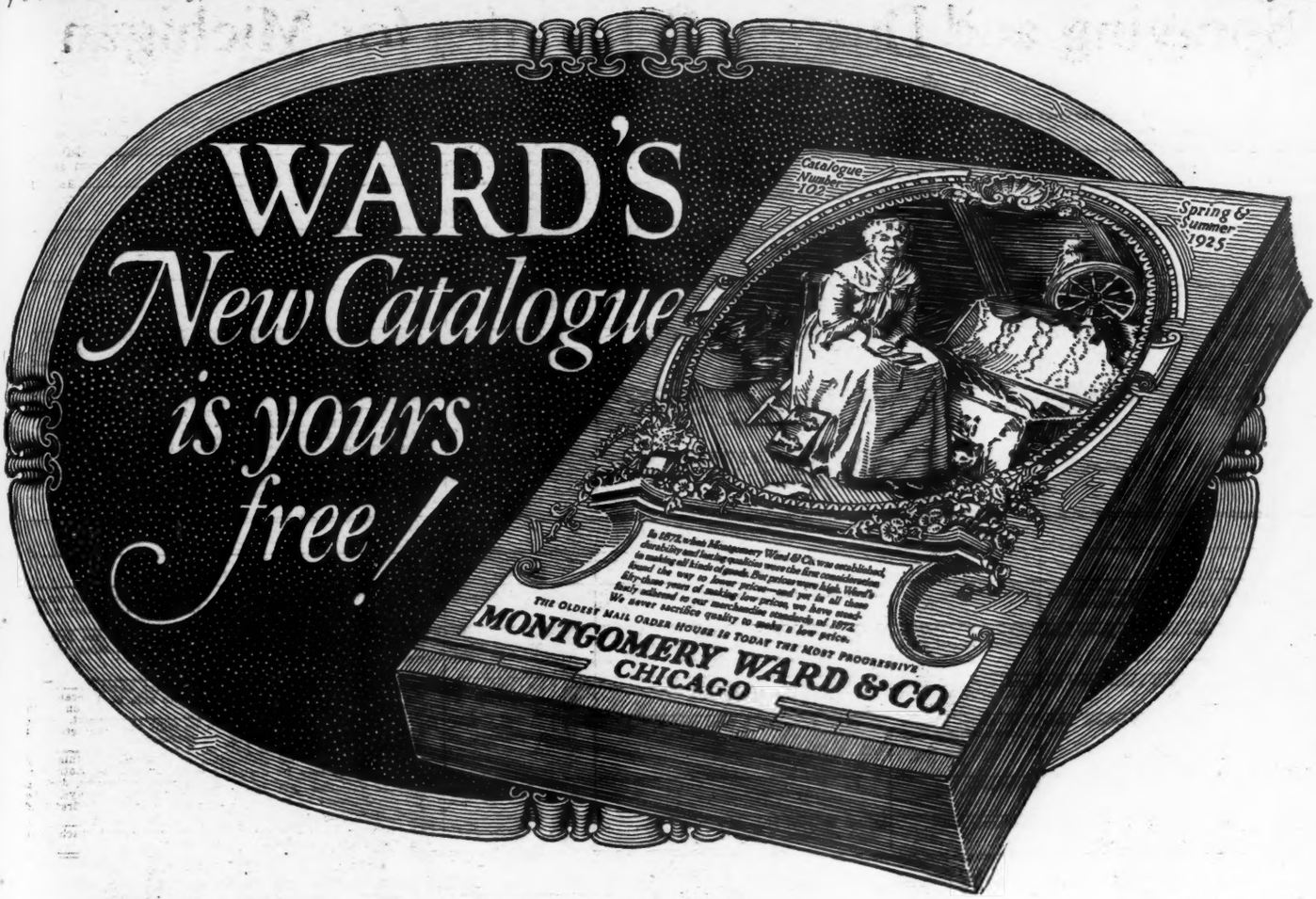
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Spraying and Dusting Schedules for Michigan

(Continued from page 12)

GRAPES

Application.	To Control.	Materials — Spraying.	Materials — Dusting.	Remarks.
When shoots are 8 ins. to 10 ins. long.	Black-rot and downy mildew.	Bordeaux, 8-8-100.	Copper dust (20% mono-hydrated copper sulphate).	
Just before the blooming period.	Black-rot, berry-moth, downy-mildew and rose-chafers.	Bordeaux, 8-8-100, plus calcium arsenate, 2 lbs. in 100 gals., or lead arsenate, 3 lbs. in 100 gals.	Copper dust (20%), with 10% to 15% calcium or lead arsenate.	If rose-chafer is present, add more arsenical.
Just as the blossoms are falling.	Black-rot, berry-moth, downy-mildew and rose-chafer.	Bordeaux 8-8-100, plus lead arsenate 3 lbs. in 100 gals., or calcium arsenate, 2 lbs. in 100 gals.	Copper dust (20%), with 10% to 15% calcium or lead arsenate.	A very important application.
Ten days to 2 weeks after the blooming period.	Black-rot, berry-moth, downy-mildew.	Bordeaux 8-8-100, plus lead arsenate 3 lbs. or calcium arsenate, 2 lbs. in 100 gals.	Copper dust (20%), plus 10% lead arsenate or calcium arsenate if necessary.	The importance of the spray application will depend upon the prevalence of rot and insects. The dust application should not be omitted at this time, but the poison may be left out if not required.
Just before the berries begin to touch in the clusters.	Black-rot, mildew, berry-moth.	Bordeaux 8-8-100, plus lead arsenate, 2 lbs. or more in 100 gals., plus resin fish-oil soap, 2 lbs. in 100 gals.	Copper dust (20%), with 10% to 15% lead arsenate.	This application is very important for berry-moth when it is serious. The leaf-hopper application may usually be made at this time but should be timed according to the development of the nymphs. Spray or dust with nicotine just before the oldest nymphs get wings. If the applications do not coincide, make a special spray of nicotine sulphate and soap. The application of nicotine dust must be made separately under any condition. If hopper nymphs continue to appear, repeat the nicotine application in 1 week to 10 days.
	Leaf-hoppers.	Nicotine sulphate (40%), 1 pt. in 100 gals. Spray upward from below with short rod and angle nozzles.	Nicotine-lime dust (2%).	

CHERRIES AND PLUMS

Application.	To Control.	Materials — Spraying.	Materials — Dusting.	Remarks.
Dormant. Apply just before growth starts. This is seldom necessary on cherries.	Scale insects.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	Sour cherries are seldom affected by scale insects and sweet cherries only occasionally. Make this application only when careful inspection shows it to be necessary.
Petal-fall. Apply soon after the petals have dropped.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs. in 100 gals. For sweet cherries, use 2 gals. of lime-sulphur.	Copper-lead dust (20% monohydrated copper sulphate and 10% lead arsenate).	This should be completed by the time the shucks are falling. Make a complete application of dust to both sides of the trees.
Two weeks. Ten days to 2 weeks after the petals are off.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs. in 100 gals.	Copper-lead dust. (Same strength as above.)	This should be completed in 2 weeks after petal-fall. Split the application of dust, applying to one side at 1 week and to the other side at 2 weeks.
Four weeks. Complete at 4 weeks after petal fall.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100.	Copper-lead dust. (Same strength as above.)	For dusting, the application should be split again, alternating from one side to the other to correspond with previous applications. Apply first half at 3 weeks and second half at 4 weeks. Another application of dust (without poison) before harvest may be desirable under some conditions.
One week to 10 days before harvest.	Brown-rot.		Sulphur or copper dust (10% to 15% copper).	On sweet varieties this application is of value in retarding the development of brown-rot just before and after harvest. Dust thoroughly but lightly.
Just after harvest.	Leaf-spot, slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs. in 100 gals.	Copper-lead dust. (Same strength as earlier application).	This is desirable to prevent defoliation during late summer.

Cherry Aphids—If the black cherry aphid has been present, spray just before blossoming with nicotine sulphate (40%), 1 pt. to 100 gals., plus 2 lbs. to 3 lbs. soap. Drench the trees very thoroughly.

Plums—In general, plums are subject to about the same diseases and insects as cherries and require the same type of treatment. Plums are more likely to be affected with scale. Inspect carefully and spray when necessary. For summer applications use lime-sulphur, 2½ gals. in 100, and increase the amount of lead arsenate if curculio is serious. The applications usually made are: (1) Petal-fall; (2) two weeks; and (3) about 1 month before harvest. The application of dust just before harvest is very important with varieties susceptible to rot. For **Japanese** varieties, do not use liquid lime-sulphur, but substitute dry-mix sulphur-lime spray or sulphur dust.

General Spray Table for the Southwest

By A. T. Potts, Texas Agricultural Experiment Station

APPLES AND PEARS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) San Jose or other scale insects.	After leaves have fallen and until growth starts in the spring.	Commercial lime-sulphur, 1 to 7, or miscible oils, 7 to 100.
(2) Apple scab, curculio, rust biting insects.	Just before blossoms open.	Lime-sulphur, 1½ to 50, and 1 lb. arsenate of lead powder (dry).
(3) Codling moth, plant lice, curculio, apple scab, biting insects.	When two-thirds of petals have fallen; rush to completion.	Lime-sulphur, 1½ to 50, 1 lb. of dry arsenate of lead and ½ pt. of nicotine sulphate.
(4) Codling moth, blotch, curculio, biting insects.	Ten days to 2 weeks after No. 3.	Lime-sulphur, 1½ to 50, and 1 lb. dry arsenate of lead.

PECANS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Nut case bearer.	(a) As new growth starts. (b) Just after nuts are set. (c) Six weeks after (b).	1 lb. of arsenate of lead (dry) to 50 gals. of water.
(2) Obscure scale.	Dormant season.	Miscible oil, 1 to 8.
(3) Scab.	After growth starts and during warm humid weather.	Bordeaux, 3-3-50.
(4) Bud worm, webb worms.	When first appear.	1 lb. of arsenate of lead (dry) to 50 gals. of water.

GRAPES

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Black rot, mildew.	After leaves have fallen and before growth starts in the spring.	Bordeaux mixture, 4-4-50.
(2) Black rot, mildew, biting insects.	When leaves are out 4 to 6 ins.	Bordeaux, 4-4-50, and 1 lb. arsenate of lead.
(3) Black rot, mildew, biting insects, sucking insects.	Ten days to 2 weeks after No. 3.	Bordeaux, 4-4-50, 1 lb. arsenate of lead and ½ pt. nicotine sulphate.

PEACHES, PLUMS, CHERRIES AND APRICOTS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Brown rot, peach leaf curl, San Jose and other scale.	After leaves have fallen and until growth starts in the spring.	Lime-sulphur, 1 to 7. If no scale, Bordeaux, 4-4-50.
(2) Brown rot, curculio, scab, biting insects, leaf spot.	When two-thirds of petals have fallen.	Self-boiled lime-sulphur, 8-8-50, and 1 lb. dry arsenate of lead.
(3) Brown rot, curculio, scab, leaf spot, biting insects.	Seven to 10 days after No. 2.	Same as No. 2.
(4) Brown rot, scab, leaf spot, curculio, biting insects.	About 4 weeks before ripening.	Same as No. 2.
(5) Borers.	Fall and winter.	Paradichlorobenzene (see U. S. Dept. Agri. Bulletin No. 1169).

CITRUS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Scale insects.	Winter.	Oil emulsion, 1 to 50.
(2) Red spider, thrip, rust mite.	When two-thirds of petals have fallen.	3 qts. lime-sulphur to 50 gals. water and 6½ ozs. nicotine sulphate.
(3) Scale insects, rust mite, red spider.	When fruit is about 1 in. in diameter.	Soda sulphur, 1 to 50, and 3 qts. oil emulsion.
(4) Rust mite.	Ten to 14 days after No. 3.	Lime sulphur, 3 qts. to 50 gals. water, or dust with sulphur.
(5) Scale insects, rust mite, red spider.	July or August.	Same as No. 3.

FIGS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Rust.	January.	Bordeaux, 4-4-50.
(2) Rust.	Just after growth starts and repeat every 3 or 4 weeks as needed.	Bordeaux, 3-3-50.

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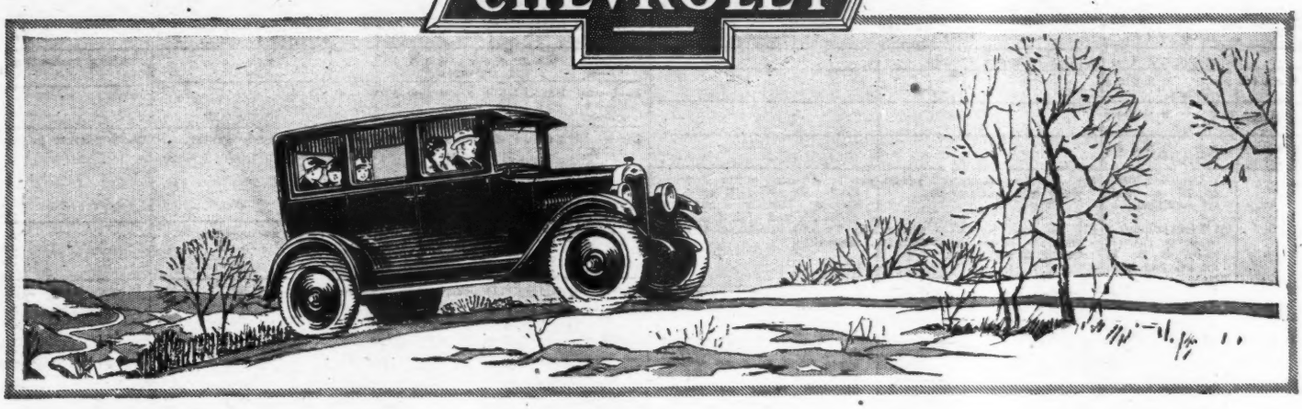

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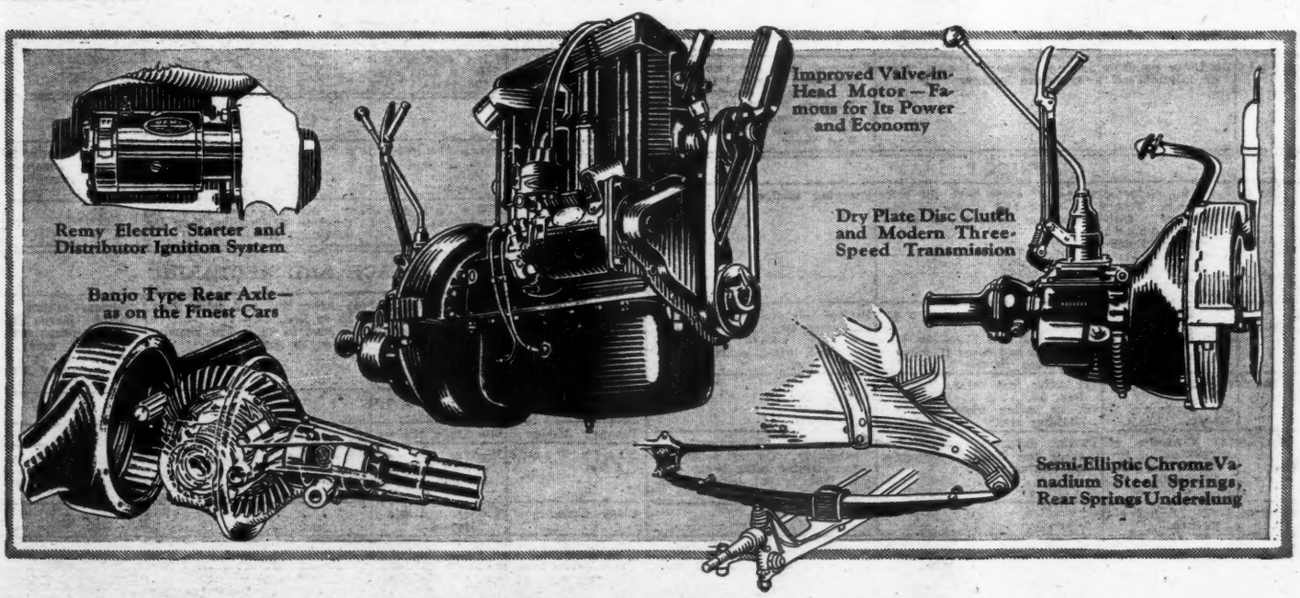
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QUALITY FEATURES
THAT MAKE POSSIBLE UNUSUAL PERFORMANCE

Spray Table for Northern California

By Warren P. Tufts, University of California

(NOTE: The following material is largely summarized from Circular No. 227 of California College of Agriculture, by Horne and Essig)

ALMOND

What to Spray For.	What to Use.	When to Spray.	Remarks.
Shot Hole.	Lime-sulphur 1-10.	Just as buds are swelling.	
Calif. Peach Borer.	See under "Peach."		
Peach Twig Borer.	See under "Peach."		
Red Humped Caterpillar.	See under "Prune."		
Red Spider.	(1) Lime-sulphur 1 to 10 or crude oil emulsion. (2) Lime-sulphur 1 to 50 or sulphur paste 8 to 21 lbs. to 100 gals. water.	(1) During dormant season when trees are leafless. (2) As soon as mites appear and as often as necessary during the summer.	(1) To kill eggs of the Bryobia. Crude oil emulsion most effective. Distillates and miscible oils not effective. (2) To kill adults of the Tetranychus.

APPLE

Pear Blight.	See under "Pear."		Spraying ineffective.
Mildew.	Lime-sulphur 1 to 35 or sulphur paste 8 lbs. to 100 gals. water.	When petals fall. Several times throughout the spring.	Sulphur sprays cause injury to apple trees in some sections of California. Cut out all diseased twigs at pruning time.
Scab.	(1) Bordeaux 5-5-50 or lime-sulphur 1-20. (2) Lime-sulphur, 1-35.	(1) As blossoms open. (2) As petals fall.	Later sprayings may be necessary in coastal sections.
Codling Moth.	(1) 2½ lbs. powdered arsenate of lead to 100 gals. water. (2) Same strength as No. 1. (3) 2 lbs. powdered arsenate of lead to 100 gals. water.	(1) As petals fall. (2) Three weeks later. (3) As needed.	In many sections of California 2 sprays are sufficient. In other locations, 4 or 5 sprays are necessary. Watch for new larvae and spray accordingly. Time varies according to locality.
Flat Headed Apple Tree Borer.	Borers only attack sunburned or other dead areas.		Spraying ineffective. Whitewash trunks to prevent sunburn. Tree protectors more efficient.
Fruit Tree Leaf Roller.	Miscible or crude oil spray.	During dormant season, when trees are leafless, to kill eggs.	Thoroughly drench limbs, particularly top and outside branches.
Green and Rosy Apple Aphis.	(1) Lime-sulphur 1 to 10. (2) Nicotine sulphate 1 pt., fish oil soap 4 to 5 lbs., water 100 to 150 gals. (3) 5 or 6% Nicodust.	(1) Late dormant just before buds open. (2) From bursting of the buds until leaf buds are one-half inch long. (3) Same as No. 2.	(1) Fair results in killing eggs. (2) Results in somewhat better control than (1). (3) Dust thoroughly.
Red Humped Caterpillar.	See under "Prune."		
Scale Insects.	(1) Lime-sulphur 1 to 10. (2) Crude oil emulsion. (3) Distillate emulsion. (4) Miscible oil.	During dormant season, when trees are leafless.	For San Jose Scale alone lime-sulphur is sufficient. For a mixed infection of scales use an oil spray; the heavier oils are more efficient.
Tussock Moth.	Destroy egg masses during winter. Jar from trees and prevent reascending by banding trees with cotton, wire screen or tanglefoot.		Spraying ineffective.
Woolly Apple Aphis.	Distillate emulsion or miscible oil.	During dormant season when trees are leafless.	For root form open up around trunk and pour in 4 to 5 gals. of spray. Delicious and Northern Spy roots are somewhat immune. See also under "Peach" Calif. Peach Root Borer.

APRICOT

Bacterial Gummosis.	Remove infected areas. Freely disinfect tools and wounds with 1 part mercuric cyanide, 1 part bichloride of mercury, 500 parts water.	Shave off outer bark for some distance and scrape to wood wherever cambium is killed.	Spraying ineffective.
Brown Rot.	(1) Bordeaux, 8-8-50. (2) Bordeaux, 4-4-50.	(1) When 1/5 of blossoms are open. (2) During full bloom or even after in bad cases if weather continues damp.	During fall and winter remove infested twigs and mummies. Sulphur sprays should be avoided, often causing small fruit
Shot Hole (Peach Blight).	(1) Bordeaux, 5-5-50. (2) Bordeaux, 5-5-50.	(1) After first rains, Nov. 15-Dec. 15. (2) In spring when buds are showing pink.	
Brown Apricot Scale. Black Scale.	(1) Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season when trees are leafless, December to February.	Thoroughness of application is necessary. Do not spray before winter rains begin even if that is not before January or February.
Calif. Peach Root Borer.	See under "Peach."		
Fruit Tree Leaf Roller.	See under "Apple."		
Peach Twig Borer	See under "Peach."		
Red Humped Caterpillar	See under "Prune."		

CHERRY

What to Spray For.	What to Use.	When to Spray.	Remarks.
Bacterial Gummosis.	See under "Apricot."		Spraying ineffective.
Leaf and Fruit Spot (Shot Hole).	See under "Apricot."		
Black Cherry Aphis.	(1) Nicotine sulphate, 1 pt.; fish oil soap, 4 to 5 lbs.; 100 to 150 gals. water or dust with 5% Nicodust.	As soon as aphids appear.	Dusting must be thorough.
Cherry Fruit Sawfly.	Powdered arsenate of lead, 3 lbs. to 100 gals. water.	When petals are opening.	
Cherry Slug.	(1) Powdered arsenate of lead, 2 lbs. to 100 gals. water. (2) 2 to 5% Nicodust.	When slugs appear.	An easy insect to control.
Pear Thrips.	See under "Pear."		
Red Humped Caterpillar.	See under "Prune."		

FIG

Smut.	No remedy known.		
Souring and Splitting.	Due to unfavorable atmospheric or soil moisture conditions.		
Mediterranean Fig Scale.	Distillate Emulsion or miscible oil or crude oil emulsion.	During dormant season.	

GRAPE

Grape Mildew.	Finest forms of dry sulphur.	When new shoots are 6 in. long, and again just before the blossoms open.	In cool or moist locations a third sulphuring when the grapes are as large as peas and a fourth when two-thirds grown.
Calif. Grape Root Worm.	Powdered arsenate of lead, 3 lbs. to 100 gals. water.	As soon as beetles appear in spring.	Cultivate thoroughly close to vines during winter to kill larvae.
Grape Leaf Hopper.	(1) Nicotine and soap or nicotine sulphate, 1 lb.; liquid soap, ½ gal.; water, 200 gals. (2) Thoroughly dust with 10% Nicodust.	(1) Before young nymphs develop wings. (2) When adults appear.	In place of 10% Nicodust may use 6% nicosulphur dust which latter will also control mildew.
Grape Phylloxera.	Use resistant vines. Disinfect cuttings or rootings before planting by dipping in hot water, 122 degrees Fahrenheit for 5 min.		Spraying ineffective.
Mealy Bug.	Difficult to control but best results have been obtained by burning sulphur under a tent over the vines.		

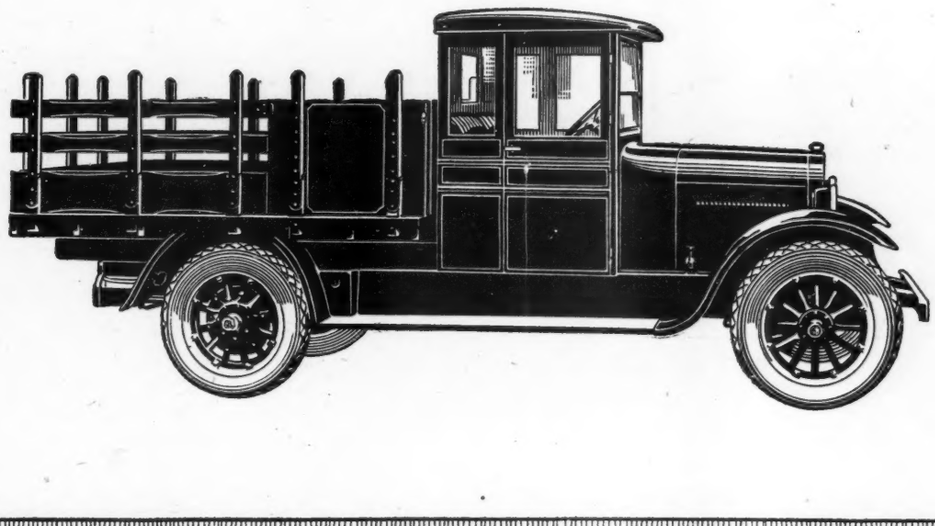
OLIVE

Olive Knot.	Cut out thoroughly at first appearance and disinfect.		Spraying ineffective. Mission variety is more resistant than the Manzanillo and certain other varieties.
Black Scale.	See under "Apricot."	Use distillate emulsion or miscible oil—weaker than for deciduous trees.	

PEACH AND NECTARINE

Peach Blight. Peach Leaf Curl.	(2) Bordeaux, 5-5-50. (2) Lime-sulphur 1 to 10.	(1) After first fall rains, Nov. 15 to Dec. 15. (2) Just as buds are showing green in spring.	Peaches cannot be sprayed after leaves appear with these sprays without injury. The fall spray is the most important for Blight; the spring spray for Leaf Curl.
Brown Rot.	See under "Apricot."		
Powdery Mildew.	See Apple Mildew.		
Black Peach Aphis.	Nicotine and soap or dust with 5% Nicodust.	As soon as insects appear.	
Black Scale.	See under "Apricot."		
Brown Apricot Scale.	See under "Apricot."		
Flat Headed Apple Tree Borer.	See under "Apple."		
Peach Rust Mite.	Lime-sulphur 1 to 10.	During dormant season.	

(Concluded on page 18)



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Spray Table for Northern California

(Continued from page 16)

PEACH AND NECTARINE—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Calif. Peach Root Borer.	Spraying ineffective. Use 1 oz. Paradichlorobenzene to the tree, spreading in a ring around the trunk, being careful to keep the material 3 in. from the trunk of the tree. Cover with 5 in. of soil mounding around trunk.	This remedy should be applied in the early fall before the ground becomes moistened.	Spraying ineffective. Increase the dosage for very large trees.
Peach Twig Borer.	Lime-sulphur 1 to 10.	As blossom buds begin to open	Addition of 3 lbs. powdered arsenate of lead per 100 gals. increases effectiveness.
Red Spider.	See under "Almond."		
San Jose Scale.	See under "Apple."		
Wheat Thrips.	See under "Pear."		

PEAR

Black End.	No remedy known. Give good care especially as to drainage.		In many cases lack of sufficient moisture may possibly be cause.
Blight.	Spraying ineffective. Cut out all affected parts thoroughly. Especially remove all "hold over" in limbs, trunk and roots during the winter. Disinfect tools and cuts freely; mercuric cyanide and corrosive sublimate 1 part of each to 500 of water in a mixture consisting of ¾ glycerine and ¼ water. In future plantings, topwork on resistant stocks.		New cankers in which cambium is not injured may be arrested by paring off the outer bark very thoroughly and applying the disinfectant. Large branches may usually be saved.
Scab.	Lime-sulphur 1 to 12 or Bordeaux 5-5-50.	(1) Just as cluster buds are opening. (2) Repeat when first blossoms are opening.	Later sprays may be necessary in moist localities.
Brown Apricot and other soft scales.	See under "Apricot."		
Cherry or Pear Slug.	See under "Cherry."		
Codling Moth.	See under "Apple."		
Fruit Tree Roller.	See under "Apple."		
Green Apple Aphis.	See under "Apple."		
Italian Pear Scale.	Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season, January or February.	Crude oil emulsions are best. Thoroughly drench limbs and trunks.
Pear Leaf Blister Mite.	Lime-sulphur 1 to 10.	November or February.	In most sections the November or early December spray gives greater control than the February spray.
Pear Root Aphis.	See under Woolly Apple Aphis under "Apple."		Japanese pear root is more resistant to this pest than the French pear root.
Pear Thrips.	Distillate emulsion 10 gals., nicotine, 1 pt., water to make 200 gals. Or dust with 5 or 6 per cent Nicodust repeatedly.	As soon as "black" thrips appear in the blossoming buds as the latter begin to open. Spray as often as necessary.	Carefully watch buds for infestation prior to opening.
Red Humped Caterpillar.	See under "Prune."		Treatment for the Italian pear scale will also control San Jose Scale.
San Jose Scale.	See under "Apple."		

PLUMS AND PRUNES

Brown Rot.	See under "Apricot."		Not often serious.
Scale Insects.	See under "Apple and Apricot."		
Calif. Peach Root Borer.	See under "Peach."		
Cherry Fruit Sawfly.	See under "Cherry."		

PLUMS AND PRUNES—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Citrus Red Spider.	See Red Spider under "Almond."		
Flat Headed Apple Tree Borer.	See under "Apple."		
Fruit Tree Leaf Roller.	See under "Apple."		
Italian Pear Scale.	See under "Pear."		
Mealy Plum Louse.	6 lbs. fish oil soap to 100 gals of water.	When insects appear in May and June.	Spraying must be done promptly before leaves are curled. The soap spray appears to give satisfactory results and is cheaper than the nicotine soap spray.
Peach Twig Borer.	See under "Peach."		
Pear Thrips.	See under "Pear."		
Red Spider.	See under "Almond."		
Red Humped Caterpillar.	(1) 5 lbs. powdered basic arsenate of lead, water 100 gals. (2) Dust with dry arsenate of lead, diluted with pwd. hydrated lime.	Whenever insects appear.	This pest is difficult to control. Close hoeing around trunks of trees during fall and spring will kill many hibernating larvae.
Tussock Moth.	See under "Apple."		

WALNUT

Blight.	No specific remedy. Plant resistant varieties.		
Codling Moth.	See "Apple." (1) Basic arsenate of lead 3 lbs. to 100 gals. water. (2) Or dust with powdered arsenate of lead and hydrated lime.	When the work of the insect is first observed in May and July.	Time of application depends upon climatic conditions.
Red Humped Caterpillar.	See under "Prune."		
Walnut Aphis.	Dust thoroughly with 2% Nicodust.	Last week of May or first part of June.	Sometimes second application is necessary in July or August.
Walnut Blister Mite.	Lime-sulphur 1-10.	When buds are swelling in spring.	Not a serious pest.

BUSH FRUITS (Blackberry, Loganberry, Raspberry)

Leaf Spot.	(1) Bordeaux, 5-5-50. (2) Lime-sulphur 1-10.	During dormant season.	Cut out and burn infected parts in fall. Renew old plantings. This disease sometimes confused with anthracnose which has not yet been identified in California.
Orange Rust.	Cut off diseased plantings below surface of the ground and burn. Bordeaux spraying is to prevent infection of healthy plants.		
Raspberry Horntail.	Spraying ineffective. Cut off wilted tips as soon as noticed and burn. Remove all dead canes in winter, using care to dig out the borers at that time.		
Rose Scale.	Distillate emulsion or miscible oil.	During dormant season.	Prune out old canes every year. Pest only serious where pruning is not regularly practiced.

CURRANTS AND GOOSEBERRIES

Mildew.	Lime-sulphur 1-33.	As buds commence to open and two or three times thereafter at intervals of 10 to 14 days.	In California use resistant varieties. Lime-sulphur 1-10, followed by a dusting with sulphur when the disease first appears has generally been effective.
Currant and Gooseberry Fruitfly.	Spraying ineffective. Cultivate thoroughly during fall, winter and spring months.		
Imported currant Borer.	Spraying ineffective. Cut out and burn all infected canes during the winter and remove the borers.		
Red Spider.	Dust with sulphur or spray with wettable sulphur or sulphur paste.	When insects appear.	

STRAWBERRIES

Leaf Spot.	Bordeaux 5-5-50.	During dormant season.	Clean up and burn leaves in late fall. Spraying necessary only in cases where disease is serious.
Strawberry Aphis.	5% Nicodust.	When aphids appear.	Apply dust to under side of leaves. Defoliate plants in fall.
Strawberry Crown Moth.	Spraying ineffective. Be sure of clean nursery stock. Remove and burn infected plants as soon as discovered.		
Strawberry Leaf Beetle.	Established infestations may be reduced by thoroughly spraying with powdered basic arsenate of lead 3 lbs. to 100 gals. of water, or dust with 1 part of basic powdered arsenate of lead to 4 parts of powdered hydrated lime. It is a severe pest and should be eradicated if possible by destroying all infested vines.		
Red Spider.	Thoroughly controlled with dry sulphur. However, this cannot be used on strawberries because of severe burning of the foliage. Very small amount of sulphur in ditches between rows affords some relief.		

Apple Tree Borers

THERE ARE a number of apple tree borers. The most serious one, however, and the one which does the most damage and needs continual watching, is the round-headed borer. This borer kills a great many young apple trees. It will also attack the pear and the quince. It lives in the tree for two years.

It is said the trees may be fairly easily detected by the reddish castings which the insect forces from the small holes near the base of the tree. About the only treatment is to cut out these insects with a sharp knife or use a sharp-pointed wire. This work should be done in late summer or early fall. After the insect starts to pupate it cannot be easily reached by a wire but at this stage a small piece of cotton saturated with carbon bisulphide may be inserted in the burrows, after which the holes should be plugged, preferably with moist earth.

The fumes of the bisulphide are likely to kill many borers not reached by the wire or knife.

The flat-headed borer stands next to the round-headed borer in importance. It generally infests or attacks trees which have been weakened from some cause or another. It is also more apt to attack trees which lean strongly in one direction, the insects laying their eggs on the strongly exposed surface where the sun shines and it is bright and warm. On the Pacific Coast this insect at times does a great deal of damage to young trees. The bark over the areas where the insects feed becomes depressed and darker in color.

The best way to fight this insect is to give the trees such good care with regards to cultivation, fertilizing and keeping them in an upright condition that the insect will not be attracted to the tree; but once the insect becomes established the only remedy is to cut out the larvae with a knife.

Put them out of business . . .

- San Jose Scale
- Blister Mite
- Peach Leaf Curl
- Peach Blight
- Apple Scab
- Pear Scab
- Apple Powdery Mildew
- Red Spider, etc.

These villainous pests can start to count their hours when you start after them right. *But*, handle them gently, and hordes of them only chuckle in their sleeves.

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Spray Calendar for Southern California

By Hugh Knight, University of California

APPLES

What to Spray For.	Treatment.	When to Spray.	Remarks.
Codling Moth.	6 lbs. dry basic arsenate of lead to 200 gals.	(1) When most of petals have fallen. (2) Just after blossoms fall. (3) 8 to 10 weeks later.	Thoroughness is the essence of codling moth spraying.
Woolly Aphis. Green Aphis. Peach Aphis.	Nicotine sulphate and liquid whale oil soap or miscible oil.	As soon as aphis appear in spring.	
San Jose Scale.	Lime sulphur 10-12 gals. to 100 gals. or 2% lubricating oil emulsion.	Dormant season.	
Apple Scab.	Bordeaux.	As soon as cluster buds open.	
Powdery Mildew.	Lime-sulphur sol., or atomic sulphur.	In spring.	Combine with (2) Codling Moth spray.

APRICOTS

Brown Apricot Scale. Black Scale.	Miscible oil or oil emulsion.	Dormant season.	
Shot Hole Fungus (Calif. Peach Blight).	Bordeaux.	Early fall.	Before heavy rains.
Brown Rot.	Bordeaux.	Early fall.	

ALMONDS

Red Spiders (mites).	Lime-sulphur sol. or atomic sulphur, or dry lime-sulphur.	Dormant season. Late spring.	Generally successful. Lubricating oil emulsions also used.
Shot Hole Fungus. (Calif. Peach Blight.)	Bordeaux.	Early fall.	May be followed by lime sulphur when buds swell in spring.

GRAPES

Leaf Hopper.	Dust with 8-10 per cent nico-dust (3-4 per cent nicotine) or spray with nicotine whale oil soap solution.	May to July. During nymphal stage.	Dusting with calcium cyanide dust in spring, when the overwintering adults attack young growth, has given good results in the dry interior valleys, including San Joaquin, Coachella and Imperial valleys, but causes foliage injury in moist or coastal regions.
Mildew.	Dust with flowers of sulphur.	(1) When shoots are 8 to 10 in. (2) When fruit is size of buckshot.	
Mealy Bug.			Not usually treated for in southern California.

CITRUS FRUITS (Oranges, Lemons, Pomelos).

Scales — Black, Citricola, Red, Yellow, Purple.	Fumigation generally recommended over spraying. Several proprietary miscible oils and lubricating oil emulsion are occasionally used. Time of treatment—All year.		
Mealy Bug.	Now controlled almost entirely by introduced natural enemies. Argentine ants must be kept away from trees if natural enemies are to do their work properly.		
Red Spider (mites).	Lime-sulphur sol. or atomic sulphur.	Whenever mites appear.	Natural enemies are now generally efficient near the coast.
Thrips.	Lime-sulphur and nicotine sulphate	Shortly after blossoming time.	May sometimes be combined with red spider control. Required only in interior.
Brown Rot.	Bordeaux.	Fall or early winter.	Usually required only on lower branches of lemons.

OLIVES

What to Spray For.	Treatment.	When to Spray.	Remarks.
Black Scale.	Miscible oil.	As early in winter as fruit is off the trees.	Olives will not stand full strength of dormant oil sprays.

PEACHES

Scales—Black and Brown.	Miscible oil or crude oil emulsion.	Dormant season.	Not generally severe on peaches.
Peach Leaf Curl. Twig Borer.	Lime-sulphur sol.	When buds commence to swell.	Dormant spray for blight may be enough.
Calif. Peach Blight.	Bordeaux.	Dormant season.	

PEARS

Thrips.	Nicotine.	As the blossom buds are opening.	
Red Spider (mites).	Lime-sulphur sol. or atomic sulphur.	When mites appear.	Often dormant oil spray will control mites.
Codling Moth.	See under "Apple."		
Pear Blight.	Spraying not effective.		Thorough pruning only remedy.

PRUNES

Brown Apricot Scale.	Miscible oil or crude oil emulsion.	Dormant season.	
Mealy Plum Louse.	Nicotine.	Just after petals have fallen.	The oil spray for scale may control aphis if applied just after harvest or just before blossoming.
Red Spider (mites).	Flowers of sulphur dust, lime sulphur solution or atomic sulphur.	Whenever mites appear.	

WALNUTS

Codling Moth.	Spray 4 lbs. dry basic arsenate of lead to 100 gals. or dust with 15 per cent arsenate lead dust.	May 25 to June 20. When hatch is well under way.	When both codling moth and aphis are present, add 1 pt. nicotine.
Aphis (when codling moth is not present).	Nico-dust.	May or June.	

SMALL FRUITS

Mildew.	Flowers of sulphur dust.	Early in spring.	
Strawberry Leaf Spot.	Bordeaux.	Just before or just after blossoming.	
Aphis.	Nicotine.	Whenever they appear.	
Red Spider (mites).	Sulphur.	Whenever they appear.	

Peach twig borers attack many of the deciduous trees occasionally. Special spraying for them is seldom practiced. Dormant oil spraying seems to be beneficial in their control.

California peach tree borer may be controlled by use of paradichlorobenzene applied to soil during warm weather.

There is a tortrix worm that occasionally does some damage to oranges, but special control measures are not employed.

Woolly aphis attacks both apples and pears, and occasionally other deciduous trees. The aerial forms may be controlled as are other aphis, but the root forms are much more difficult to combat. There is no proven economical method of control on old trees.

Strength of Materials to Use

Bordeaux—
For fall or dormant deciduous spraying, 5-5-50 or Bordeaux powder, 18-20 lbs. to 200-gal. tank.
For spring deciduous or any citrus spraying, 2-2-50 or Bordeaux powder 8-12 lbs. to 200-gal. tank.

Lime Sulphur Solution—
20 gals. to 200-gal. tank for all purposes listed except on citrus during warm weather, reduce to 6 gals. Casein has proven a very efficient spreader. Use at rate of 1½ lbs. to tank (200 gal.) with any of the sprays recommended.

Atomic Sulphur—
20 lbs. to 200-gal. tank for all purposes listed.

Nicotine—
1 pt. to 200-gal. tank. 3 gals. of liquid soap is an aid as a spreader.

Miscible Oil—
Several proprietary preparations for which the formulas vary.

Crude Oil Emulsion—
Crude oil (21-24)..... 25 gals.
Liquid soap ..... 3 gals.
Water .....175 gals.

The Spraying of Black Raspberries

(*Continued from page 4*)

ous damage had resulted on the Cumberland (the most widely grown variety), and some injury on the Plum Farmer.

Both the Plum Farmers and the Cumberlands used in this experiment had been old fields, which were not available for spraying or records the following year. During 1920 an attempt was made to study spray injury on raspberries, rather than primarily disease control. Unfortunately, no Cumberlands were then available, and only Plum Farmers and Kansas were sprayed. Partly for this reason and partly, no doubt, because of very different weather conditions, spray injury was as conspicuously absent during 1920 as it had been serious the year before. Because of the small size of the plats used, yield records were not considered reliable indicators.

Since that time these experiments have not been repeated or extended, because other work has seemed of more immediate importance. But it is very desirable that there be brought together as much information as possible on the subject of spray injury to raspberries.

Spray Injury Common in Blackcaps

Since the unsatisfactory test described, the writer has seen, in several states, many fields of raspberries which have been sprayed, both commercially and for experiment. And in his opinion a fairly large proportion of these have shown more or less injury, sometimes indicated only by lack of vigor, lighter colored foliage, or death of the lower leaves. And nearly always, the later in the season that the last application has been made, the greater the damage. Usually this damage has been hard to demonstrate, for raspberry growers do not ordinarily leave unsprayed rows for checks. But sometimes an adjacent or near-by field of the same variety and age could be found for comparison, which would half convince a grower that there was some difference, so that the following year he would leave unsprayed rows of his own.

Reports of spray injury have come from Indiana, New York, and Kentucky, as well as from the West. And the examination of a large number of sprayed and unsprayed fields in widely scattered localities, especially in Michigan and Ohio, has convinced the writer and some other observers that spray damage too often occurs unseen.

Raspberry Injury Often Seen Only in Reduced Yields

Of course, spray injury is sometimes induced on other plants or trees, but it is usually conspicuous, so that the fruit grower notices it and can reckon its extent; often it is disregarded as having caused less loss than would have resulted from the diseases which were controlled; and he may deliberately repeat the same program next year, knowing that if wrong weather conditions prevail he may again cause some damage. But if he ruins a crop he is very likely to look for some safer method for the future. So far as raspberries are concerned, except in extreme cases, the only way to tell whether the spray has done more good than harm is by keeping a careful record of the yield of fruit.

This can scarcely be expected of the commercial grower. But experimental workers should by all means include such records in their duties and reports, since these data, if from sufficiently large plats, should be a

(*Concluded on page 23*)

Improve the *vigor* and *production* of your orchard

San José Scale

Oyster Shell Scale

Terrapin Scale

Aphis Eggs and Nymphs

European Red Mite Eggs

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Spray Schedule for New York

Prepared by Entomologists and Plant Pathologists of the New York State Agricultural Experiment Station and the New York State College of Agriculture

APPLES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Delayed dormant. When leaves of blossom buds are out ¼ in. to ½ in.	Lime-sulphur, 11 gals.; lead arsenate, 2½ lbs.; nicotine sulphate, ¾ pt.; water to make 100 gals.	Scale, blister mite, bud moth, leaf-roller, casebearers, aphids.	No satisfactory dust for scale or blister mite. Rosy aphis has not been so efficiently combated with dust as with sprays. For aphids, 90-10 sulphur-lead arsenate dust* with 2% nicotine is the most promising.
Pre-blossom. When blossoms show pink or earlier if a rainy period threatens.	Lime-sulphur, 2½ gals.; lead arsenate, 2½ lbs.; water to make 100 gals.	Scab, green fruit worms, bud moth, leaf-roller, casebearers.	Apply 90-10 sulphur-lead arsenate dust.* In a bad outbreak of scab, spray as much as possible, using dust to complete the operation.
Calyx. When the last of the petals are falling.	Lime-sulphur, 2½ gals.; lead arsenate, 2½ lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Scab, codling moth, green fruit worms, bud moth, curculio, lesser apple worm, redbugs.	Apply 90-10 sulphur-lead arsenate dust.* For red bugs, use 90-10 dust with 2% nicotine. In a bad outbreak of scab, spray as much as possible, using dust as a supplement.
Later sprays. To be determined by weather conditions and control of scab.	Lime-sulphur, 2½ gals.; lead arsenate, 2½ lbs.; water to make 100 gals.	Scab, codling moth, curculio, lesser apple worm, apple maggot.	Later applications with 90-10 sulphur-lead arsenate dust.* In prolonged rainy periods use dust at shorter intervals than indicated for sprays.

*Copper lime dust may cause russeting, especially at the calyx application.

PEARS

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Dormant. Early in the spring when the adult thrips first appear on the buds, just as the bud scales begin to separate.	Miscible oil, 5 gals.; nicotine sulphate, 1 pt.; water to make 100 gals.	Thrips.	No satisfactory dust for control of scale or pear thrips burrowing into opening buds.
Cluster bud. When blossom buds separate in the cluster.	Lime-sulphur, 11 gals.; water to make 100 gals.	Scale, scab, psylla eggs.	No efficient dust for scale or psylla eggs.
Calyx. Just after the petals fall.	Lime, 30 to 40 lbs.; copper sulphate, 2 lbs.; arsenate of lead, 2½ lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Codling moth, psylla nymphs, scab.	No efficient dust for young psylla nymphs. 90-10 sulphur-lead arsenate dust for scab and codling moth.
Two weeks after the petals fall.	Lime-sulphur, 2 gals.; water to make 100 gals. or Bordeaux mixture, 3-10-50.	Scab.	Psylla flies and hardshells are sensitive to nicotine dusts, but value of treatment has not been proved.
Emergency spray in summer when psylla becomes abundant.	Lime, 30 to 40 lbs.; copper sulphate, 2 lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Psylla nymphs.	No satisfactory dust for late broods of young nymphs.

PEACHES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Late fall or early spring, before buds swell.	If scale is abundant, use lime-sulphur 11 gals., water to make 100 gals. If there is no scale, use lime-sulphur, 6½ gals., water to make 100 gals.	San Jose scale, leaf curl. Leaf curl.	Dust not advised.
When blossoms show pink.	Self-boiled lime-sulphur, 8-8-50.	Blossom blight, brown-rot.	Apply 95-5 sulphur-lead arsenate dust.
When shucks are falling.	Self-boiled lime-sulphur, 8-8-50, and arsenate of lead, 3 lbs. in 100 gals.	Brown-rot, scab, curculio.	Apply 90-10 sulphur-lead arsenate dust.
Two or 3 weeks after shucks fall.	Self-boiled lime-sulphur, 8-8-50.	Brown-rot, scab.	Apply 95-5 sulphur-lead arsenate dust.
Two to 4 weeks before fruit ripens.	Self-boiled lime-sulphur, 8-8-50.	Brown-rot, scab.	Apply 95-5 sulphur-lead arsenate dust.

CHERRIES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Delayed dormant. When bud scales separate and expose green blossom buds.	(For sweet cherries only.) Lime-sulphur, 11 gals.; nicotine sulphate, ¾ pt.; water to make 100 gals., or nicotine sulphate, ¾ pt.; soap, 5 lbs. or 6 lbs.; water to make 100 gals.	Scale, aphids. Aphids.	No satisfactory dust for scale. Control of aphis by 90-10 sulphur-lead arsenate dust with 2% nicotine not yet demonstrated. Thorough dusting with 2% nicotine dust should reduce number of insects.
Just before blossoms open.	Lime-sulphur, 2½ gals.; water to make 100 gals.	Brown-rot, blossom blight.	Apply 95-5 sulphur-lead arsenate dust.
When petals fall.	Lime-sulphur, 2½ gals. (sweet cherries, 2 gals.); arsenate of lead, 2½ lbs.; water to make 100 gals.	Leaf-spot, brown-rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
Ten days after petals fall or when shucks are off.	Lime-sulphur, 2½ gals. (sweet cherries, 2 gals.); arsenate of lead, 2½ lbs.; water to make 100 gals.	Leaf-spot, brown-rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
Just before cherries turn red.	Lime-sulphur, 2½ gals. (sweet cherries, 2 gals.); arsenate of lead, 2½ lbs.; water to make 100 gals.	Leaf-spot, brown-rot.	Apply 90-10 sulphur-lead arsenate dust.
Fruit-fly spray. When fruit-flies appear.	Arsenate of lead, 2½ lbs.; water, 100 gals., or lime-sulphur, 2½ gals. (sweet cherries, 2 gals.); arsenate of lead, 2½ lbs.; water to make 100 gals.	Fruit-flies.	The merits of dusting in controlling fruit-flies are not definitely established.
After picking.	Lime-sulphur, 2½ gals. (sweet cherries, 2 gals.); arsenate of lead, 1 to 2 lbs.; water to make 100 gals.	Leaf-spot.	Apply 95-5 sulphur-lead arsenate dust.

PLUMS

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
While buds are dormant.	Lime-sulphur, 11 gals.; water to make 100 gals. (All varieties.)	Scale.	No satisfactory dust for scale.
When shucks are off young fruits.	Lime-sulphur, 2 gals.; arsenate of lead, 2½ lbs.; water to make 100 gals. (All varieties except Japanese.)	Leaf-spot, brown-rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant 80-20 sulphur-lead arsenate dust.
From 14 to 20 days later.	Lime-sulphur, 2 gals.; water to make 100 gals. (All varieties except Japanese.)	Leaf-spot, brown-rot.	Apply 95-5 sulphur-lead arsenate dust.
Before fruit ripens.	Lime-sulphur, 2 gals.; water to make 100 gals. (All varieties except Japanese.)	Leaf-spot, brown-rot.	Apply 95-5 sulphur-lead arsenate dust.

Japanese Varieties—On Japanese varieties follow the same schedule as to time of spraying. For the application when the buds are dormant, use lime-sulphur 1 to 8 as directed above. For subsequent applications instead of lime-sulphur solution, use self-boiled lime-sulphur, 8-8-50, or lime-sulphur glue mixture. Sulphur-lead arsenate dust may be used with safety on Japanese varieties.

GRAPE SPRAY SCHEDULE FOR FINGER LAKES REGIONS

Time of Application.	Spray Mixtures.	Enemy.
About 1 week before the blossoms open. See note.	Bordeaux mixture, 4-4-50.	Black rot, mildew.
As soon as the berries set.	Bordeaux mixture, 4-4-50. If larvae of flea-beetle are present, add arsenate of lead, 1½ lbs.	Black rot, mildew, flea-beetle.
Two weeks later. Subsequent applications to be determined by weather conditions and the previous control of black rot and mildew.	Bordeaux mixture, 4-4-50.	Black rot, mildew.

Note—The directions for lime-sulphur are based on the standard strength 32 to 34 degrees Baume solution.

Grape leaf hopper may be controlled by very thorough spraying, using the following formula: Bordeaux mixture, 4-4-50; nicotine sulphate, ½ pt. in 50 gals. of water. The application should be made soon after July 4 when the newly hatched nymphs are on the leaves. An upturned nozzle must be used and care taken to hit the insects. Unless the leaf hoppers are extremely abundant, a special spray for this insect is not likely to be profitable.

Note—The amount of arsenate of lead is given in these schedules for powder form; if paste form is used, twice as much is required.

Note—The directions for lime-sulphur are based on the standard strength 32 to 34 degrees Baume solution.

Interesting Facts About Spray Materials

(*Continued from page 3*)

regulated amount. Such a process is covered in a patent issued to Ellis and Stewart.

Most of the calcium arsenate on the market today is made by carefully adding arsenic acid solution to an excess of slaked lime held in suspension in hot water. This excess of lime causes the finished product to have a very definite amount of lime over that needed to prepare the pure calcium arsenate, and hence is a material that is very satisfactory for spraying very tender foliage.

There are some very important changes that will take place in stored calcium arsenate that will cause it to burn foliage. The calcium arsenate powder in open containers will slowly absorb carbon dioxide from the air and so convert the excess lime present to limestone, and hence the water soluble arsenic content will run up to a dangerous amount. However, when the material is stored in steel drums or other air-tight containers, no change will take place, and even after long-storage it will be perfectly safe.

Bordeaux Mixture

The oldest fungicide spray is Bordeaux mixture. It was discovered by accident in 1878 in the grape vineyards of southern France, near Medoc, by Prof. Millardet of the Department of Botany in Bordeaux. In an attempt to keep grapes along the roadsides from being stolen, Prof. Millardet endeavored to discolor them by treating them with a wash he prepared by combining blue vitriol and lime with water. After noting that these grapes possessed an increased resistance to plant diseases, he began to study the spraying problem. When he used dry materials to prepare his mixture, the foliage was destroyed because the dry lime is not active enough to completely neutralize the copper sulphate or blue vitriol. If Prof. Millardet could have used some of the present-day hydrated lime, it is possible that we would never have had the liquid Bordeaux that we use today. In fact, a dry Bordeaux is now manufactured that gives excellent results. Usually the spray is prepared just previous to use by mixing the dilute copper sulphate with the dilute lime water. Some companies prepare such a solution, add a material to keep the mixture from caking, and then remove the water and sell the dried product. However, the protective agent commonly added, glue or casein, usually renders the re-mixed spray less effective.

Lime-Sulphur

Another widely used spray is lime-sulphur. In this case, like that of Bordeaux, most users prefer to prepare the spray as they use it. The sulphur is caused to react with the lime by the heat generated in slaking. Also, there are on the market several dry lime-sulphur preparations. In manufacturing these, the proper spray is made and then later dehydrated. It is dried in large room-like chambers by the aid of hot gases from oil-fired furnaces. The lime-sulphur is sprayed into the chambers and meets the hot gases after they have gone through a cyclone separator to remove the particles of fuel, and the dried material falls to the floor and is carried away by the use of screw conveyors. Tankage or glue is usually added to these dry lime-sulphur preparations to promote spreading and also to protect the finely-divided particles of the original spray.

Sulphur alone has been used as a spray for fruit trees, but with very little success. In the ordinary yellow form, it seems to have very little activity and usually does not pay for the trouble of applying. It is only when very finely divided, in the atomic or colloidal form, that any value results from the use of sulphur.

It is to be regretted that better methods are not known for the preparation of the improved forms, especially since our country has the greatest supplies of raw sulphur known in the world. However, this subject is being investigated by many persons, and improvements may be developed at any time.

Shipments of grapes from New York during 1924 totalled 4288 cars to October 31, as compared with 3346 cars to the same date in 1923.

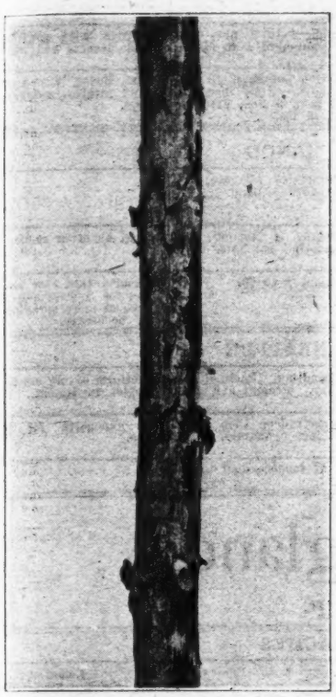
The Spraying of Black Raspberries

(*Continued from page* 20)

reliable key to the state of vigor of the plants. And fruit growers who spray their raspberries will do well to leave a part of their field unsprayed for comparison, even though no picking records may be taken.

Spraying Apparently Successful in Places

There have been some very careful experiments carried on, the results of which seem to conflict with these ob-



Raspberry stem infected with anthracnose

servations. In Wisconsin, spraying experiments on raspberries have been conducted for several years by the experiment station. Their results indicate excellent disease control, under Wisconsin conditions, without accompanying spray injury, even though fungicides were applied while the plants were in foliage. The Illinois station has reported similar results.

By no means is it recommended that raspberry spraying be abandoned. Anthracnose is too serious a pest in certain localities and seasons, and it can be controlled by spraying. The important thing is to find how this can be done *every year* without damage. Further experiment may show some new mixture, or a certain strength of a known fungicide, which will accomplish the purpose with entire safety.

Use Discretion in Selection of Sprays

Until it has been repeatedly demonstrated that we have such a method, discretion should be used in the application of sprays. The dormant application—or, better, the "delayed dormant," when the leaves show green—has been effective in reducing anthracnose infection, though it has not controlled it entirely. For this application, lime-sulphur of dormant strength can be used, apparently without danger of injuring the bushes or reducing the crop. Beyond this spray, the fruit grower in the middle or southern tier of raspberry states (New York, Ohio, Indiana, and apparently Michigan) must run some risk of injury during unfavorable years. In certain cases, the seriousness of anthracnose justifies the risk. Perhaps he can safely make one foliage application when the shoots are only a few inches above the ground. During the average year he may get away with a full program of three sprays without damage, but he should try it—on Cumberlands—with his eyes open.

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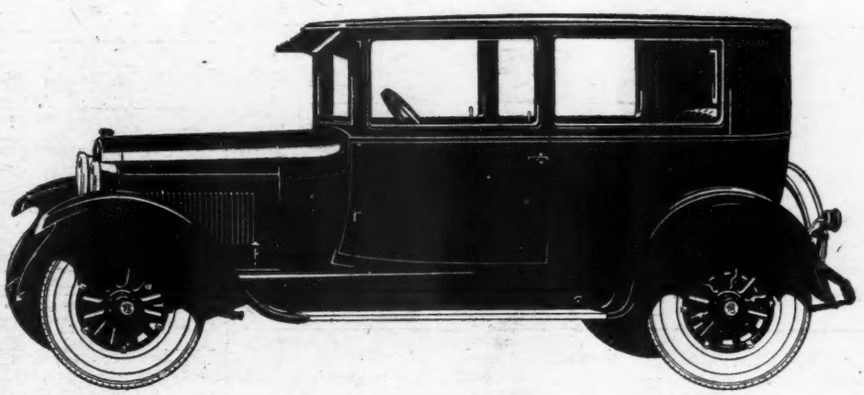

Avoid Spreading Disease in Plants

Regarding anthracnose, it is well to remember one or two simple preventive measures, which may be taken when planting a new field, that are likely to retard the development and spread of the disease. First, raspberry tips should be planted before they have started to grow. Even when this is done, one further precaution should be taken. When plants are dug there is left on each rooted tip a section of the old cane, which serves as a convenient "handle" in digging, bunching and planting, but which may also carry the infection to the new shoots when they start to grow. It is wise to remove this stub before planting the root.

Conclusions

It is decidedly not the wish or intention of the writer to discourage anthracnose control, or the deliberate spraying of raspberries for that purpose, but to bring before small fruit growers and investigators some of the risks connected with the methods at present recommended; to prevent in the future, if possible, damage such as has occasionally been caused by following custom or advice without due care or without checking up on the value of the practice.

But above all, it is desired to stimulate thought and discussion on the subject, in order to bring to light other experiences; to prompt further experiments in various parts of the country, under different conditions; so that finally we may have much more knowledge on which to base advice which can be relied upon with safety wherever raspberries are grown.

After an apple is frozen, it should not te touched by the hands. If handled, it will discolor. If allowed to thaw slowly the fruit will not be a total loss. It may become mealy but will still be valuable for eating and cooking purposes.

Some folks say it is a good thing to keep a bowlfull of nice fruit on the table all the time. It is a good deal better, however, to keep it emptied all the time.

Spray Calendar for Florida Fruits

By W. L. Floyd, University of Florida

FOR GRAPEFRUIT AND SATSUMAS

Pest.	Time.	Remedy.	Remarks.
Scab. Melanose	March or April. Soon after petals have fallen.	Bordeaux-oil mixture. Make 3-3-50 Bordeaux, add concentrated oil emulsion to give 1 per cent of oil to mixture.	Important for preventing and checking these diseases on tender growth. If only melanose be present, spray about 1 month later.

FOR ALL SPECIES OF CITRUS

White Fly. Scale Insects. Rust mites.	May. When fruit is 1 in. in diameter.	Oil emulsion diluted to contain 1 part oil to 99 parts water, then add 2½ lbs. dry soda-sulphur to 100 gals.	Oil emulsion sometimes injures small fruit; it should be 1 in. or over in diameter to be safe.
Rust mites. Red Spiders.	June. During dry weather.	Dust with Flowers of Sulphur, or spray with lime-sulphur, 1 gal. to 50 gals. water.	Watch for mites. Apply before they become numerous.
White Fly. Scale Insects.	Early in July. After rainy season begins.	Parasitic Fungi. Red Aschersonia. Red-headed fungus.	Dissolve spores off in water, strain and apply with a clean hand sprayer. If obtainable add spores of Brown, Gray-headed and Black fungi.
White Fly. Scale Insects. Rust mites.	October or November.	Oil Emulsion in which soda-sulphur is dissolved.	Same proportions as given in second.

SPECIAL SPRAYING NOT USUALLY NECESSARY UNDER NORMAL CONDITIONS

Scab.	Early February. Before new foliage unfolds.	Bordeaux-oil mixture	Same as first on Grapefruit and Satsumas where much scab is present. Important on young non-bearing trees. Prune out diseased parts as much as possible before spraying.
Thrips.	March. When about one-half the petals have fallen.	Nicotine sulphate with lime-sulphur. Use 13 oz. nicotine sulphate and 2½ gals. lime-sulphur to 100 gals. water. More often necessary on Satsumas.	Apply when 25 or more thrips are found to the blossom.
Rust mites. Red Spiders.	August or September. When mites become noticeable.	Dust with flowers of sulphur, or spray with lime-sulphur 1 to 50.	Watch for mites if weather becomes dry. Apply before they become numerous.
Ammoniation of fruit.	October or November.	Apply copper sulphate, spread like fertilizer about tree, 2 lbs. to 6 lbs. per tree.	This prevents development of ammoniation on next crop of fruit.

FOR AVOCADO

Pest.	Time.	Remedy.	Remarks.
Scab (Cladosporium Citri). Black Spot (Colletotrichum sp.). Blotch (Cercospora sp.).	March. (1) Latter part of blooming period. (2) Three weeks later. (3) Three or 4 weeks later.	3-3-50 Bordeaux Mixture.	Three sprayings are usually sufficient, though a fourth may sometimes be necessary.
Scale Insects. White Fly.	October. As foliage begins to harden. Repeat in December.	Oil emulsion, 1 to 70.	Alternate this with spraying for thrips, lace bugs and spiders, when they are present.
Leaf Thrips. Lace Bugs. Red Spiders.	November to March, when pests are found.	Lime-sulphur 1 to 60 plus 40% nicotine sulphate 1 to 900.	Alternate with spraying for scale insects and white fly.
Flower Thrips. Blossom Anomala. Leaf Roller.	Early March when in bloom if pests are found.	40% nicotine sulphate, 13 ozs. to 100 gals. water, then add fish oil soap 2 lbs., arsenate of lead, 3 lbs.	Unless thrips are numerous omit nicotine sulphate and soap.

FOR MANGO

Anthracnose (Colletotrichum gloeosporioides). Blossom Anomala.	March. When in bloom.	3-3-50 Bordeaux Mixture, 1½ lbs. arsenate of lead.	
Red Spiders. Leaf Thrips.	November to March when pests are found.	Lime-Sulphur, 1 to 60 plus 40% nicotine sulphate, 1 to 900.	Repeat as often as necessary.
Scale Insects.	December to February. When trees are dormant.	Oil emulsion, 1 to 70.	Alternate this spraying with one for Spiders and Thrips. Two or more sprayings may be necessary.

FOR PINEAPPLE

Soft Rot. (Thielaviopis paradoxa.)	Fruit after ripening.	Careful handling. Packing only when dry. Prompt shipment.	Sometimes severe among pineapples in transit.
Red Wilt (Caused by nematode).	Six to 8 weeks before setting plants.	Breaking soil deep then applying calcium cyanamid, 1 ton to acre.	Too expensive for general use.
Red Spiders. Mealy Bugs.	In periods of dry weather.	Handful of tobacco dust in bud of plant.	

Spray Schedule for New England

By Fred C. Sears, Massachusetts Agricultural College

APPLES

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Delayed dormant. Early spring as buds are breaking.	Lime sulphur, 6 gals. in 50. 40% nicotine sulphate, ⅝ pt.	Aphis, San Jose scale, blister mite.	This spray has almost entirely superseded the dormant application. Where bud moth is plentiful, growers delay application as late as possible and add 2 lbs. dry arsenate of lead.
(2) Pre-pink. Before the clusters of blossom buds separate.	Lime sulphur, 1 gal. in 50.	Apple scab.	Used on McIntosh and other varieties especially subject to scab. Very effective when weather conditions are bad at this season.
(3) Pink spray. As blossom buds begin to show pink.	Lime sulphur, 1 gal. in 50; dry arsenate of lead, 1½ lbs.; nicotine sulphate, ½ pt.	Red bug, scab, curculio, aphis, tent caterpillar, bud moth, brown tail moth, gypsy moth, canker worm.	In areas where the gypsy moth is troublesome the amount of arsenate of lead is doubled. A very important spray in this section.
(4) Calyx. Within a week after the petals fall.	Lime-sulphur, 1 gal. in 50; dry arsenate of lead, 1½ lbs.; nicotine sulphate, ½ pt.	Codling moth, scab, curculio, red bug, aphis, gypsy moth, sooty fungus, skeletonizer.	Generally regarded as the most important single spray.
(5) Three or 4 weeks after calyx spray.	Same as calyx spray except no nicotine sulphate.	Same as calyx except red bug and aphis.	Special sprays 1 and 2, noted below, are often substituted for this application.

NOTES

1. **Special Sprays**—The following special sprays are sometimes applied in addition to those listed above, or one or more of them may be substituted for No. 5:

1. Where plum curculio is serious on apples a spray of arsenate of lead, 1½ lbs. to 50 gals., is applied a week or 10 days after the calyx spray. If scab is developing, 1 gal. lime sulphur is added.

2. In seasons or localities where sooty fungus is expected to be serious a spray of lime sulphur, 1 gal. to 50, is made about the last of July, or 2 months after the calyx spray.

3. A special spray for railroad worm, skeletonizer and Brooks spot is sometimes made about July 1, using dry arsenate of lead, 3 lbs.; lime sulphur, 2 gals.; water to make 100 gals.

2. Dry lime sulphur is being somewhat more commonly used in New England, especially by small growers who are some distance from the railway.

3. Dusting is not very generally used with apples in New England.

PEACHES

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Dormant spray applied in late autumn or early spring before buds begin to swell in the least.	Lime-sulphur, 7 gals., water to make 100 gals.	Leaf curl.	If San Jose scale is present use 12 gals. lime-sulphur instead of 7.
(2) When blossoms show pink.	Dry-mix sulphur lime, 25 lbs.; water to make 100 gals., or self-boiled lime-sulphur, 16-16-100.	Brown rot.	
(3) Just as shucks start to fall.	Dry-mix sulphur-lime, 25 lbs., or self-boiled lime-sulphur, 16-16; dry arsenate of lead, 3 lbs.; water to make 100 gals.	Brown rot, scab, curculio.	The most important single spray.
(4) Ten days or 2 weeks after No. 3.	Same materials as No. 3.	Brown rot, scab, curculio.	
(5) Three or 4 weeks after No. 4.	Dry-mix sulphur-lime, 25 lbs., or self-boiled lime-sulphur, 16-16; water to make 100 gals.	Brown rot, scab.	Should not be used on early ripening varieties.

NOTE—Some growers are using dusting to a considerable extent for summer applications to their peach orchards.

PEARS

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Cluster bud spray. As blossom buds are separating in clusters.	Lime-sulphur, 11 gals.; water to make 100 gals.	Scale, scab, blister mite, psylla (eggs and hibernating adults).	
(2) Calyx. Just after petals fall.	Quick lime, 40 lbs.; copper sulphate, 2 lbs.; dry arsenate of lead, 3 lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Codling moth, scab, psylla, curculio, false tarnished plant bug, leaf spot.	Most important single spray.
(3) Three to 5 weeks after calyx spray.	Same materials as calyx spray except nicotine sulphate.	Codling moth, scab, other fungous diseases and leaf-eating insects.	

SPECIAL SPRAYS

1. A special spray for blister mite when they are abundant, same materials as for cluster bud spray, applied before the buds break. Miscible oil is sometimes used in place of lime-sulphur when European red mite eggs are present.

2. An emergency spray for psylla, applied when nymphs become abundant, which is likely to occur almost any time during the growing season. Same materials as for calyx spray.

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The Citrus Aphid

By W. L. Floyd
University of Florida

THERE appeared in a progressive and developing citrus section near the west coast in the early spring of 1923 an unusual infestation of aphids on tender growth of citrus trees. At first it was thought to be the melon aphid (*Aphis gossyppii*), which occasionally attacks citrus, but a careful study of its life history and characteristics showed it to belong to a different species. It seems to be more closely related to the apple aphid (*Aphis pomii*), the relationship being so close that some entomologists think it is the apple aphid, which has adapted itself to the citrus host.

Shortly after it first appeared reports of its presence in a number of groves along the west coast counties were published. Its injury and spread seem to have been checked by summer, but were renewed in the fall. By May of 1924, it had spread throughout most of the southern citrus region, so badly attacking new growth in many places that growth was much retarded and young fruit caused to drop. By summer the aphids were few in number and doing little damage.

The species has been identified by the Bureau of Entomology as the *Aphis Spiraecola*, Patch, a species found often on spirea or bridal wreath. It has a wide distribution, as spirea is much grown. It has been found on loquats, sand pears and wild plum growing among citrus trees, and probably thrives on a number of other plants.

The young aphids are a light green color, growing darker as they grow older. This insect in Florida gives birth to young; these in five to 10 days begin to bring forth young at the rate of about five a day for from three to 21 days.

Parasites and Methods of Control

These aphids are preyed upon by three classes of predaceous insects; the syrphus flies, lady beetles, and lace wing flies. They are also attacked by internal parasites to a limited extent; eight species of predaceous enemies have been found feeding on them.

Beneficial fungi are important in destroying this pest. During the summer of 1924 they were destroyed in great numbers by one of the entomogenous fungi, related to those destroying white fly. It is probable that one reason why they are so numerous and destructive in the spring is because conditions are not then favorable for the fungus.

Oil emulsions and nicotine sulphate solution sprays kill all insects hit by them; but the aphids attack the underside of the young leaves and their attack causes the leaves to curl over them, forming a canopy, so that it is very difficult to reach them.

A dust made of 92½ pounds of hydrated lime and 7½ pounds of nicotine sulphate is perhaps the most successful remedy used so far. It is quite expensive and can hardly be used except on young or occasionally badly infested trees. Tobacco dust when quite strong has given good results at less cost, and as the tobacco has a fertilizing value to the soil, it is better to use it for this reason, but its weak and variable strength as found on the market is an objection to its use.

Whether this aphid is an old form which has recently acquired a taste for the orange is uncertain. Dr. Baker of the Bureau of Entomology thinks it quite possible that it has long fed upon it, but is held in check most of the time by enemies that we know imperfectly. Climatic conditions may occasionally be unfavorable to these enemies, when an epidemic of the aphids occur.

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Shot Hole or Bacterial Spot of Peach

By H. W. Anderson
University of Illinois

ABOUT 20 years ago those interested in the culture of stone fruits began to notice a new leaf spot which frequently caused early defoliation of the trees. They also noticed an injury to the fruit which was evidently new. Experiment station and federal pathologists at once began a study of these troubles and came to the conclusion that both were due to the same organism—a small germ or bacterium similar in many respects to that causing fire blight of pear and apple. The disease was at that time found in several widely separated sections of the country, so it is evident that it had been present, either on cultivated stone fruits where it had escaped attention, or on wild species of the plum and peach, from which it was transferred to the orchards. Since the disease is known only in this country, it is probable that it originated here on wild fruits. At present, bacterial spot is known to occur to a destructive extent in all peach growing sections east of the Rocky Mountains.

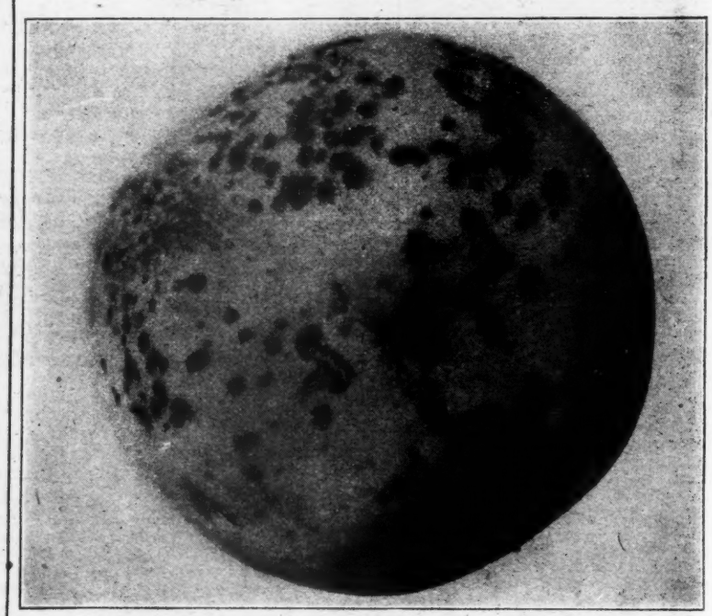
What Is Bacterial Spot?

Most peach growers are familiar with this disease, but some who have recently set out orchards may wish to know what to look for and how to distinguish this disease from others which attack the peach. As a matter of fact, not all spots or shot hole effects on the leaf are due to bacteria or fungi. Frequently spray applications, especially with strong arsenate of lead, result in a spotting of the leaves, which is very difficult to distinguish from the tree bacterial spot. This is especially true of poorly nourished trees, where almost any spray will result in spotting, and at times spotting may occur where no spray is applied.

True, bacterial shot hole is caused by a microscopic, rod-shaped organism called *Bacterium pruni*. This organism enters the leaf through the breathing pores which are located *only on the lower surface* of the leaf in the peach. After the bacteria have multiplied enormously in the tissue of the leaf, a small, dark, purple spot, somewhat angular in outline, appears. The effect on the leaf may be seen by consulting the accompanying figure. The spots may not be as numerous as here illustrated. After growing for a while, the bacteria seem to be checked either by unfavorable weather conditions or by some reaction of the plant; and the diseased tissue is cut off from the surrounding healthy tissue and may fall out, thus giving a shot hole effect. It is unfortunate that this disease has received the common name "shot hole," since usually only a small per cent of the spots fall out.

The injury resulting from the spots would really be of little importance if this was the extent of the injury, but, unfortunately, the bacteria seem to give off some poisonous substance which causes the leaves to drop, although only a few spots may be present on a single leaf. This dropping of the leaves is what alarms the grower because he realizes that the tree cannot function properly with most of its leaves on the ground.

The injury to the fruit itself is probably even more serious from a commercial standpoint than the injury to the foliage. As illustrated in the accompanying figure, the effect on the fruit is a chapped appearance, usually on the upper surface and nearer the blossom than the stem end. Numerous dark purple or black spots appear, and these are crossed by minute cracks. These cracks do not extend into the flesh, but frequent deep cracks appear as a result of restriction of normal growth at this point. The general appearance of the fruit resembles some spray injury, and many growers at one time thought sprays to be the cause of this condition.



A peach showing injury from shot hole fungus

Loses from Shot Hole

The injury to the fruit is frequently so pronounced that buyers refuse to handle the peaches unless the diseased ones are removed. Ordinarily only a small per cent of the fruit in an orchard is badly marked, but during the past summer I saw several orchards of J. H. Hale which had from 90 to 95 per cent of the fruit marked, and fully half of these could not be packed. Gum frequently exudes from the cracks and further reduces the market value of the fruit.

From our experience with other injuries to the fruit, we would expect brown rot to follow this cracking. However, this has not proved to be so, except where deep cracking results, and this is exceptional.

Where complete, or almost complete, defoliation takes place before the ripening period, the fruit is often sun-scalded and stunted in its growth. The defoliation also devitalizes the

(*Continued on page* 38)

The Oriental Peach Moth

(Continued from page 5)

found that adding 40 per cent nicotine in a sulphate form to the ordinary sprays of the regular schedule, beginning with the shuck fall, reduced the amount of infestation found in fruit by 13 to 14 per cent. In a 50-acre orchard experiment in New Jersey in the season of 1924, Mr. Stearns found a similar result. His field work seemed to indicate that the nicotine strength 1-800 was just as good as 1-500; that four treatments with nicotine were just as successful as six; that nicotine in the liquid form was more efficient than nicotine applied in the dust form; that tobacco dust was more efficient against the eggs than nicotine dust; and that the additional amount of worm-free peaches, resulting from the 1-800 liquid treatments, was much more than ample to pay for the use of the nicotine.

Laboratory studies of the effect of various gases upon the eggs of the Oriental peach moth indicate that the destructive agent must be sought in nicotine, pyrethrum, derris, or mechanical agents.

Field work and life history studies during the past season seem to indicate that the time of application of nicotine may be made better to coincide with egg-laying periods of the moth, and that if such coincidence

Peach moth twig injury. This twig shows an advanced stage of wilt. The worm may or may not be inside the twig (Photo by Peterson)

can be obtained, better results in control for money expended can be obtained. It is, therefore, planned to run life history studies at strategic points in New Jersey, and to issue, through the county agent organization, recommendations relative to time of application.

Basing our ideas upon the results of this season's work, we plan to make the following recommendations for treatments against the Oriental peach moth, as follows:

1. Plow four inches, or more, deep, and disk thoroughly, so as to break the entire soil surface, leaving only that which one must in order to avoid skinning the tree trunks. Do this work during the month of April. Disking alone will help, but will probably not prove as efficient as plowing and disking. In case disking must be resorted to, because of plowing being impractical, it is suggested that the orchard be disked in the late fall and again in the spring. Of course, if the soil is likely to blow or wash, the fall disking should be omitted.

2. Treat the peach trees in the fall with paradichlorobenzene exactly as recommended for the peach borer, because this action will kill peach moth larvae wintering on the base of the tree. This treatment should be made as late in the fall as the temperature will permit.

3. Spray according to the regular (New Jersey) schedule, adding 40 per cent nicotine to each treatment, commencing at the shuck fall (at the rate of 1-800, and utilizing spray card service to determine when treatments should be made.

Future Work

Life history and control studies will be continued during the season of 1925. Especial attention will be paid to the ability of the Oriental peach moth to migrate from one part of an orchard to another part, and from one orchard to other orchards. Especial attention will also be devoted to the discovery of a method for killing larvae of the Oriental peach moth which over-winters on the peach tree from points six or eight inches above the ground to the ends of the twigs, with the idea that a discovery of practical methods for this purpose would take the control of this insect out of the growing season entirely and place it in the dormant season. In the control studies will also be included an investigation of the killing effect on pyrethrum in various forms, as well as derris and mechanical agents.

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Apple Tree Anthracnose

APPLE tree anthracnose, sometimes known as black canker, is the bad canker disease found on apple trees in the Pacific Northwest. This disease is especially bad in two-year old wood but at times when trees have been weakened by winter injury, it will attack some of the largest body limbs on the tree and work with great rapidity. The wounds caused by this disease will run together and will at times kill trees and whole orchards are ruined by the disease. Spores will also get on the fruit and cause a disastrous decay or rotting of the fruit.

Anthracnose, however, is a fairly easy disease to control when growers will work carefully. The Oregon Experiment Station years ago showed how to handle this disease efficiently. Where it is bad in an orchard, the first spray should be given about the first of August and it should be Bordeaux, at the strength 4-4-50. As soon as the fruit has been gathered in the fall, a second spray should be given, but this time winter strength Bordeaux is generally used, using 6-6-50 strength, or one may use lime and sulphur, winter strength. If a treatment like this is followed for a few seasons, the disease can generally be eradicated or at least can be reduced to a point where it is not much of a menace. By a little inspection of the trees to examine the wounds in winter, one can easily tell how bad the disease is developing. After the first of January it is too late to spray. It may be of value at times, however, to take a sharp knife and shave off the tops of the wounds. This may prevent them from forming spores and from growing further. This is an expensive and tedious proposition, however, and spraying should be the principal method of controlling this disease.

And Lasted Longer

An old gentleman was attending a football game with a young enthusiast.

"You'll get more excitement and see more rough stuff than you ever got for $2 before," enthused his young companion.

"I doubt it," replied the old gentleman as fond memories flashed through his mind. "That is all my marriage license cost."

Railways Desire to Render Good Service

THE railways are confronted with the necessity of handling in 1925 a larger freight business than ever before. Past experience and present conditions indicate the nation is entering an era of prosperity and that demands for transportation service will largely increase year by year. Upon how the railways are able to meet these demands will depend the prosperity that can be enjoyed by farmers and other classes of people.

The railways were returned to private operation five years ago under the Transportation Act, which required them to be honestly, efficiently and economically managed and assured them, if they were so managed, the opportunity to earn a "fair return" in order that they might be able to provide adequate transportation service.

A Record of Performance

The railways cite their record of performance as proof that they have accepted in good faith, and given effect to the best of their ability to, the purposes of the Transportation Act. By the adoption of every possible economy they have largely reduced their operating expenses. Reductions of rates made since 1921 are saving the public about $700,000,000 a year. Reductions upon farm products have been larger than on any other class of commodities.

The Interstate Commerce Commission has held the railways entitled to earn a return of 5¾ per cent on their valuation. The railways since the Transportation Act was passed have earned only about two-thirds this much. Nevertheless, they have within the last two years been raising and investing new capital in locomotives, cars and other improvements at the rate of about one billion dollars a year.

The results of this investment, and of increases in efficiency that have been made, are reflected in the improved service rendered the shipping public. Within the last two years the railways have handled more carloads of freight than ever before without "car shortages" or serious delays.

Farmers Rendered Adequate Service

There were large advances in the prices of grain in the latter part of 1924. The farmers desired to ship grain in unprecedented rapidity and volume to take advantage of these higher prices. A serious car shortage would have caused them losses of many millions of dollars. There was no car shortage, but on the contrary in the months of August, September, October and November the railways promptly loaded and moved 1,133,000 carloads of grain and grain products, an increase of 25 per cent over the same months of 1923. The railways had to solve equally difficult problems in handling the crops of fruits and vegetables requiring refrigerator cars.

Such transportation service is of inestimable value to producers and shippers. However large future increases in business may be the railways desire to continue to render such service. They cannot do so unless allowed to earn a "fair return."

Situation of Western Railways

While some western railways are prosperous, the Interstate Commerce Commission expressly held in its decision in the western grain rate case in July, 1924, that the western roads as a whole were not earning a fair return. Their net operating income in 1923 was $88,500,000 less than in 1917, and was only 3.94 per cent on their property investment. In the first eleven months of 1924 it was only 3.87 per cent. Practically all the capital western railways have invested in increased facilities since the war has been raised by borrowing and going more deeply into debt. They cannot continue to raise new capital unless they are allowed to earn an adequate net return.

Freight Rates on FarmProducts

One means which continues to be advocated for improving the condition of agriculture is a readjustment of freight rates that would involve a reduction of the rates on farm products. Only 7½ per cent of the tonnage of eastern railways and only 9½ per cent of the tonnage of southern railways consist of farm products, while 21 per cent of the tonnage of western railways consists of farm products. Therefore such a readjustment of rates would especially cripple western railways, upon which western farmers depend to get their products to market.

Since special reductions of freight rates on farm products were first proposed there has been a revolution in the relation between freight rates and farm prices. The average freight rate of western railways is only 37 per cent more than in 1913. The average wholesale price of all farm products, according to the Department of Commerce, was 56.7 per cent higher in December, 1924, than in 1913. Between June 2 and December 30 the cash price of corn in Chicago increased from 77⅞ cents to $1.28 a bushel and that of wheat from $1.10 to $1.88. Present relations between farm prices and freight rates of western railways afford no justification for special reductions of rates on farm products.

What the Interstate Commerce Commission Said

The Interstate Commerce Commission said in its decision in the western grain rate case last July: "There is serious doubt whether farmers would not in many instances lose more from impaired railway service than they could possibly gain from a reduction in rates, even if the farmers would get the entire benefit of any reduction made."

We solicit the co-operation of western farmers to enable western railways to furnish the transportation service the farmers require.

This is one of a series of advertisements published to give the farmer authentic information about railroad matters. Any questions that you would like to ask will be cheerfully answered. Address:

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Orchard Spray Program

By Leroy Childs, Hood River Experiment Station, and

On account of the climatic differences existing between the more humid orchard sections west of the Cascade Mountains and the semi-arid or arid and irrigated regions east of this range, the conditions as to pests and diseases are different and require a somewhat different spray program. In general there are a greater number of diseases and pests to be sprayed for in western Oregon, Washington and British Columbia than in the drier orchard sections of the interior. Hence the full spray program for the section west of Cascades will be presented and then followed by paragraphs outlining the program for other sections.

SPRAY PROGRAM I

For humid sections of Washington, Oregon and British Columbia west of Cascades

APPLES AND PEARS

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Dormant spray. As winter buds swell just before opening.	San Jose Scale, blister mite and Spider mites. (Footnote 6.)	Lime-sulphur 12 to 100 or miscible oil 8 to 100.
	Apple leaf roller. (Footnote 5.)	Dormoil 8 or 10 to 100.
(2) Pre-pink (delayed dormant) spray. Cluster buds separating just enough to expose blossom buds.	Scab and powdery mildew.	Lime-sulphur 3½ to 100.
	Anthracnose (Footnote 4) and scab.	Bordeaux, 6-6-50.
	Aphids on apple. (See Footnote 1.)	Add nicotine sulphate ¾ lb. to 100 gals. of spray.
(3) Pink or pre-blossom spray. Just before blossoms open.	Scab and Mildew.	Lime-sulphur 2½ to 100.
	Fruit worms on pear and bud moth.	Add lead arsenate 3 lbs. to 100 gals. of spray.
(4) Calyx spray. As last petals fall. Before apple calyx closes on central fruit in cluster.	Scab and Mildew.	Lime-sulphur 2½ to 100. (Footnote 2.)
	Codling moth on apple.	Lead arsenate, 2 lbs. to 100 gals.
	Fruit worms on pear (if pink spray was not applied).	Lead arsenate 2 lbs. to 100 gals.
	Leaf roller, where infestation is moderate.	Lead arsenate, 4 lbs. to 100 gals.
(5) Fifteen-day spray. About 15 days after petals fall.	Scab and Mildew.	Lime-sulphur, 2 to 100 (Footnote 2).
	Pear slug.	Lead arsenate 2 lbs. to 100 gals.
(6) Thirty-day or first cover spray for worms. Three to five weeks after petals fall.	Codling moth. (Footnote 3.)	Lead arsenate 2 lbs. to 100 gals.
	Scab and Mildew.	Non-caustic or wettable sulphur spray (see "Spray Pointers").
(7) July spray. July 10 to 25 depending on locality and season.	Codling moth, second generation.	Lead arsenate, 2 lbs. to 100 gals.
	Anthracnose canker.	(See Footnote 4.)
(8) August spray. August 10 to Sept. 5 depending on season and locality.	Codling moth. (May usually be omitted on pear.)	Same as for No. 7.

Footnote 1. Where aphids are very bad, especially with varieties somewhat resistant to scab, omit nicotine from Spray No. 2, adding it to Spray No. 3, which should then be applied just as soon as the blossom buds separate from each other. For severe infestations of brown aphids, the most satisfactory spray used in the Hood River valley has been the oil spray applied as indicated in Application No. 1 just as the buds begin to show green. However, if blister mite is present, see Footnote 6.

Footnote 2. Ordinary lime-sulphur will russet the skin of some varieties of pears like d'Anjou, Comice and Howell, and may cause burning of apples when hot weather comes on. Under such circumstances substitute a non-caustic or wettable sulphur spray. See "Spray Pointers."

Footnote 3. Codling Moth control is such a complex problem and of such outstanding importance, that too much dependence should not be placed upon a general spray program of this nature. Supplement the suggested program with all the trained assistance and advice obtainable. The most important period in codling moth control begins with the calyx spray and extends 4 or 5 weeks thereafter. Where worm losses have been heavy, keep fruit thoroughly covered during this period as first brood worms are very active and the fruit rapidly loses its protective coating because of rapid growth. The late cover spray may usually be omitted on pear. Supplement the spraying by the careful collection of wormy fruit at thinning time; it pays. Scrape the scaly bark from the trees during February and March, band the trees in June and destroy the accumulated worms every 2 weeks. Increasing the dosage of lead in the late cover spray to 3 lbs. or 4 lbs. to 100 gals. is a fairly common practice and, for bad worm infestations, is advisable. Codling moth is not a commercial orchard pest of British Columbia and no program of control is required.

Footnote 4. Anthracnose or black spot canker and fruit rot may be successfully prevented by a single thorough summer application of Bordeaux mixture 4-4-50. Where the disease is reasonably well under control, however, recent studies conducted at the Hood River Station indicate that Bordeaux mixture 6-6-50 when substituted for lime-sulphur in Spray No. 2 is of much value in reducing infection without the disadvantage caused by the coating of the fruit with Bordeaux in the summer. The spring Bordeaux spray, however, must be applied before the fruit buds are much exposed, to avoid russeting. Bordeaux 6-6-50 applied with the oil spray is also proving of great value in the Hood River district in reducing anthracnose. In filling tank, add lime first. Fill tank two-thirds full; slowly add dissolved bluestone, lastly add oil, which, before adding, should be stirred up and emulsified with an equal amount of water. A very thorough application is necessary as this spray must stay on the trees until fall, at which time it becomes effective in controlling the disease.

Footnote 5. Leaf Rollers occur as a major pest only in certain of our fruit sections. Oil emulsion in the early pre-pink (delayed dormant) is the standard spray. Dormoil has given uniformly better results in leaf roller control than other western oils. Some miscible oils are apparently of little value in control. Where conditions develop that prevent maximum effectiveness from the oil spray and for very light infestations of leaf-roller, use double strength lead arsenate (4-100) in the pink and calyx sprays.

Footnote 6. Blister mite on apple, during the past two or three years, has become one of the most serious pests of this fruit in the Northwest. Tests conducted during the past year at the Hood River Station indicate lime-sulphur to be the best means of control and should be used in all orchards where this mite is present in serious numbers. Apply lime-sulphur 10-100 (12-100 if scale is present) any time in the spring before buds begin to open. Control cannot be obtained after green begins to show on buds. Oil 8-100 is effective during a much more limited time; this period is between the time scales are separating on buds and before green tips show. Warm, sunny weather greatly assists in increasing control. Every bud in the tree must be hit with the spray material as in these buds the mites over-winter.

Footnote 7. Three species of red spiders are troublesome in the apple and pear orchards of the Northwest. In some sections all are present, in others one or two of the three are present. Control measures for two are alike but for the third species a different recommendation must be made. On account of this situation, it is necessary to know the particular spider giving trouble. The so-called European red spider and the brown mite over-winter in the egg stage on the tree. The third species, or so-called common red spider, hibernates in trash on the ground and is not on the trees when the first spray is applied. Oil spray at the rate of 3 per cent or more is recommended for the first two species indicated. For the common red spider, the usually recommended sulphur sprays applied during early spring are quite effective. If all three of these pests are troublesome in the summer, a weak oil spray containing ½ per cent to ⅔ per cent of lubricating oil is recommended.

PRUNES AND PLUMS

(1) Dormant spray. As winter buds are ready to open.	San Jose Scale, spider mite, twig miner.	Lime-sulphur 12 to 100. If scale is absent dilute 8 to 100.
(2) Pre-blossom spray. Buds white just before opening.	Brown rot (Monilia) Blossom blight.	Bordeaux 4-4-50 with spreader or lime-sulphur 3 to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
	Aphids.	Nicotine sulphate ¾ lb. to 100 gals.
(3) First fruit spray. As soon as shucks fall.	Cylindrosporium leaf spot and brown rot.	A non-caustic or wettable sulphur spray. See "Spray Pointers."
	Syneta beetle.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
(4) and (5) About June 1 and July 1.	Cylindrosporium or brown rot if troublesome.	As under (3).
(6) August spray. About a month before harvest.	Brown rot.	As under (3).

for the Pacific Northwest

H. P. Barss, Oregon Agricultural Experiment Station

PEACHES

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Leaf Curl spray. From December to mid-February.	Peach Leaf Curl.	Bordeaux mixture 6-6-50.
(2) Late dormant spray. Just as first buds are ready to open.	Peach twig miner, San Jose scale, spider mite.	Lime-sulphur 12 to 100. If scale is absent, dilute S to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
(3) First fruit spray. As soon as shucks fall.	Peach blight (fruit spot), mildew or brown rot.	A non-caustic or wettable sulphur spray. See "Spray Pointers." If bad repeat once or twice at 2 or 3 week intervals.
(4) Late summer spray. About 6 weeks before harvest.	Brown rot.	Same as No. 3 or use dusting sulphur when air is still.
(5) Early fall spray. As soon as each variety is picked.	Peach blight and die back.	Bordeaux 4-4-50.

CHERRIES

For San Jose Scale—Same as No. 1 on prune program.

For Aphids—Use nicotine sulphate, 1 lb. to 100 gals. with pre-blossom spray (same as No. 2 for prune). Use tanglefoot bands on trees to prevent reinfestation of aphids by ants.

For Syneta Beetle—Use lead arsenate 2 lbs., plus lime 2 lbs., and 100 gals. water, applying when most of the petals have fallen to prevent fruit injury.

For Cherry Fruit Maggot—Use sweetened poison spray for adult flies. Use: **Lead arsenate**, ½ lb.; syrup, 2 qts.; water, 8 gals. Apply about 1 qt. to the tree, spraying the upper surface of the outer leaves only; when adult flies appear. This will be from June 8 to 20. Repeat application 10 days later and give a third spray one week after second.

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program.

For Cylindrosporium Leaf Spot—(Yellow Leaf). Same as Nos. 3, 4, 5, on prune program.

For Brown Rot on Fruit—Use a non-caustic or wettable sulphur spray or sulphur dust 1 month before picking. Begin earlier if disease shows up sooner and repeat every 2 or 3 weeks till a month before picking.

APRICOTS

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program. Where blossom blight has become very severe and in very wet springs, a similar spray may be desirable as the winter buds open, and another about in full bloom. Prune out and destroy all dead twigs and spurs in winter.

For Fruit Spot—(Peach Blight fungus.) Same as Nos. 3 and 5 on peach program.

San Jose Scale and other insects same control as for similar insects on peach.

SPRAY PROGRAM II

For semi-arid sections of the Northwest east of Cascade Range and for Rogue River Valley in Oregon.

APPLES AND PEARS

Scab—Present and troublesome only in a few localities. Where sufficiently abundant to justify spraying, apply Nos. 3 and 4 in Program 1 for apples and pears.

Powdery Mildew—Use applications Nos. 2, 3, 4 and 5 in Program 1 for apples. Continue if necessary. Observe Footnote 2. Use casein spreader first dissolved in water. Supplement by winter and summer pruning out. Pink spray most important to avoid sulphur shock.

Codling Moth—Following the calyx application, the first cover spray (15 to 20 day) is applied just before the first worms hatch. In general this will be earlier for Interior (15 days) than for coast area. Follow with second cover spray 2 weeks after first cover spray; third cover spray, 4 weeks later; and fourth cover spray, 4 weeks after third.

For southern Oregon an additional late cover spray may be necessary. Double strength lead in late sprays advisable. Calyx spray on pears likewise advisable in southern Oregon.

For eastern Washington, northern Idaho, the Grande Ronde Valley of Oregon, follow Program 1, although in higher altitudes probably two cover sprays will generally suffice.

Citrus Red Spider—Use spray No. 1 in program 1.

Blister Mite—Use spray No. 1 in Program 1. For apple see Footnote 6.

Leaf Rollers, Fruit Worms, San Jose Scale, Aphids—Follow Program 1 for these insects.

PEACHES

Leaf Curl, Mildew and California Blight, Twig Miner, San Jose Scale, Spider Mite—Follow Program 1 for these diseases and insects.

CHERRIES

Practically no fungous diseases requiring spray. Insects in general would require no regular program of sprays. For specific pests follow Program 1 for cherry.

APRICOTS

California Blight—Follow Program 1 for peach blight. Insect pests and treatment same as for peach in Program 1.

PRUNES AND PLUMS

No fungous diseases requiring spray as a rule.

San Jose Scale, Twig Miner and Spider Mite are principal insect pests. Where present control with spray No. 1 in Program 1 for prunes and plums.

SPRAY POINTERS

The proportions of lime-sulphur recommended for sprays in this program are based on the use of the standard concentrated liquid lime-sulphur testing about 32 degrees by Baume hydrometer test. **Where the powdered or "dry lime-sulphur"** is used, it will take about 4 lbs. of the dry powder to equal in active ingredients 1 gal. of the standard concentrated liquid lime-sulphur. For example, where this program recommends "lime-sulphur 12 to 100," the grower employing the dry form should use 48 lbs. of the dry lime-sulphur with every 100 gals. of water to get the same strength of spray.

Non-Caustic or Wettable Sulphur Sprays—Within recent years substitutes for lime-sulphur have been devised which do not have the caustic or burning action of the latter and hence are safer to use on tender-skinned varieties of pears and apples and on stone fruits. These sprays are not very active as fungicides or insecticides when the weather is cool and hence cannot always be relied upon for effective action in the early spring. They are, however, active in warm weather, such as may usually be expected from the time the pear and apple blossoms have fallen. They are safe and effective in warm weather in the control of scab, mildew, leaf spot and brown rot. It is usually advisable to employ a soap or casein spreader with them unless a spreader is used in the composition. These spray materials are much easier to prepare or use than the old self-boiled lime-sulphur and are to be recommended wherever the latter has been advised in the past. Among these wettable sulphur sprays may be mentioned the well-known Atomic Sulphur (use 12 lbs. to 100 gals), "Dry-Mix" sulphur and lime, and "Oregon cold-mix" lime and sulphur. To prepare the latter, use superfine sulphur 8 lbs. and hydrated lime 4 lbs. Mix together (thoroughness not required). Pour into the mixture 2 qts. milk (skimmed is entirely satisfactory) and stir into a smooth paste, adding water if too thick, and finally pour through strainer into spray tank with enough water to make 50 gals. with the amounts of materials mentioned. Other satisfactory materials are now on the market.

The powdered form of lead arsenate is the basis of the formulas for this poison recommended in this program. If paste form is used employ double the number of pounds indicated.

Bordeaux Mixture is most satisfactory when freshly made according to standard methods. The "ready-mixed" type of commercial Bordeaux is in general decidedly inferior to good home-made spray. The type of commercial Bordeaux powders, in which the powdered bluestone and hydrated lime are sold in separate packages and added separately to the spray tank, appear to be better than the materials combined by the manufacturer. The hydrated lime must not have become air-slaked (carbonated) when used and directions must be followed carefully or poor results will be obtained.

Home-made Bordeaux must be used the same day it is made or else ordinary cane sugar must be added at the rate of 1 oz. (1 heaped tablespoon) for every 8 lbs. of stone lime or 10 lbs. of hydrated lime employed. The sugar should be dissolved before adding to the tank of Bordeaux. It prevents the spray from crystallizing and deteriorating.

Oil sprays are increasing in popularity throughout the country. Up to the present time, however, observations made in Oregon at least do not seem to indicate that an oil emulsion of less than 6 per cent should be recommended for the control of San Jose scale. Some growers, after using oil for several years at the above strength, are going back to the use of lime-sulphur. Probably some unknown factors are influencing results obtained in different parts of the country.

Spreaders—Materials used with a fungicide or insecticide spray to increase the spreading and adhesive powers are rapidly coming to the front. Calcium caseinate is excellent for use with lead arsenate alone. Where added in powder form to sprays containing Bordeaux, lime-sulphur or other fungicide it sometimes gums things up badly. In such cases it is suggested that the spreader be completely dissolved in water before adding to the spray tank.

Dusting—Experimental work in the Northwest in general has not been very encouraging to the substitution of dusting for spraying especially in those sections subject to severe attacks of fungous diseases under relatively cool climatic conditions, but improved materials, machinery and application methods now under test may show dusting to be worth while in controlling certain special pests.

Spray Combinations—Any of the materials mentioned in this spray program in connection with any particular application may be successfully combined, but it is best not to add lead arsenate to a tank of diluted lime-sulphur until the last thing before starting to spray.

Sulphur Shock—Under certain climatic conditions if lime-sulphur has not been used on apple trees in the earlier pre-pink or pink applications, a very severe injury with foliage and fruit drop may result when lime-sulphur is applied later after blooming. This is known as sulphur shock and occurs without regard to strength of spray. Immunity against this danger can be secured only by application of the pre-blossom sulphur-containing sprays as scheduled.

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- ☐ No. 6. "Sulphate of Ammonia, by Those Who Know."
- ☐ No. 8. "The Use of Sulphate of Ammonia in the Fertilization of Peaches."
- ☐ No. 9. "Arcadian Sulphate of Ammonia—The Perfect Ammoniate."
- ☐ No. 10. "Fertilizing the Apple Orchard."
- ☐ No. 13. "The Use of Sulphate of Ammonia in the Apple Orchard."
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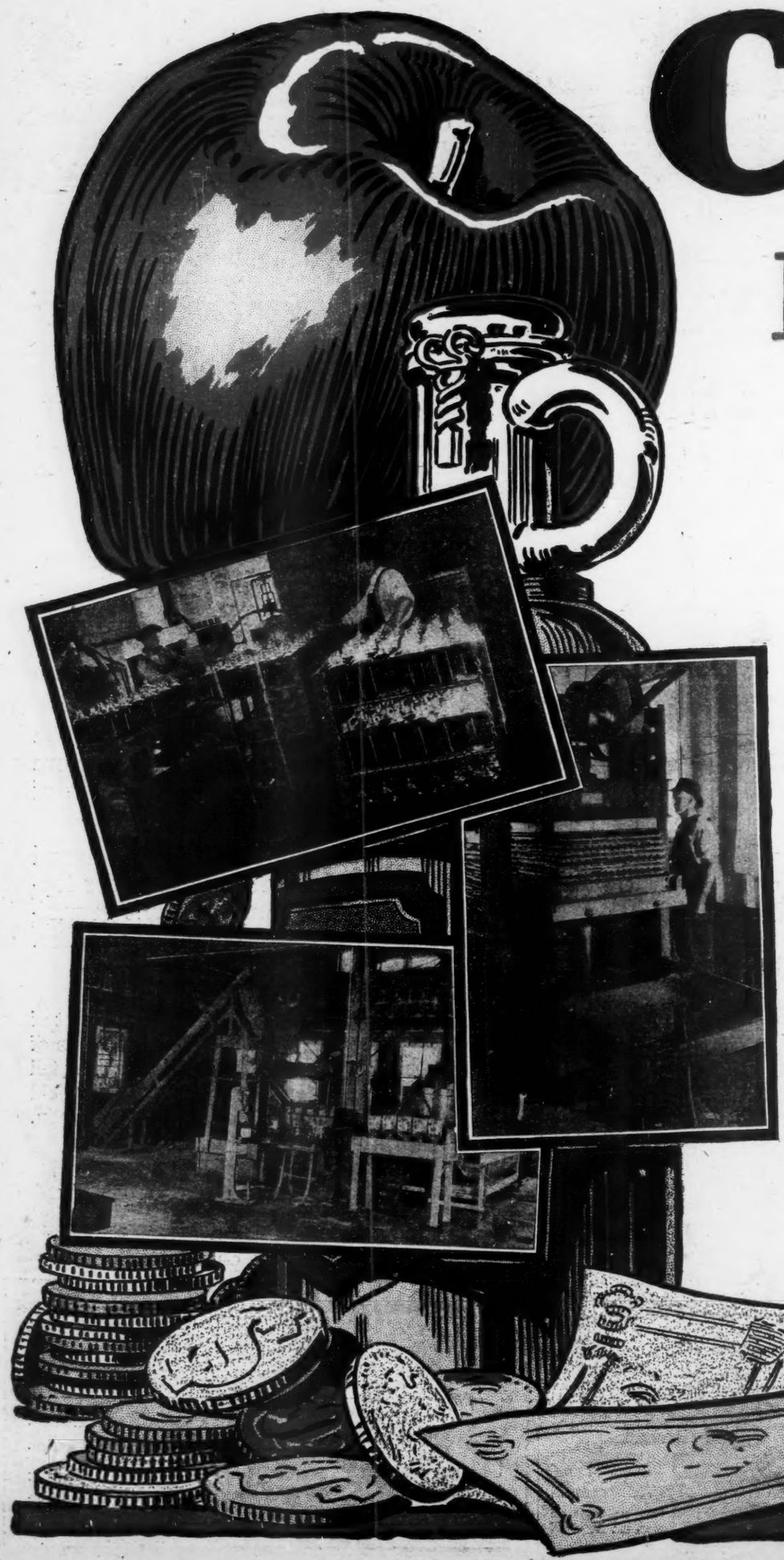

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er— large ...—an increasing demand—and an all year 'round business. That is what progressive orchardists l Process h... done for the cider business. Cider manufacture is now a sound money-making industry that knows no er has bec... the favorite fruit juice drink of the nation.

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Spraying Calendar for Rocky Mountain District

By Laval S. Morris, Brigham Young University

APPLES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Codling moth.	Arsenate of lead, 3 lbs. to 100 gals. water.	(1) Immediately after petals fall. (2) Ten days to 2 weeks later. (3) One month later. (4) Spray later if necessary.	The powdered arsenate of lead is preferable. If the paste is used, double the amount stated.
San Jose scale.	Lime-sulphur, 1 to 8, or miscible oil.	In spring before buds open.	Severely infested old trees should be removed. If insects are bad in summer, they may be partly checked by light kerosene emulsion.
Oyster shell scale.	Concentrated tobacco solution, 2 pts. to 100 gals. water, or 15% kerosene emulsion.	In spring when eggs are hatching.	Treatment for San Jose scale will perhaps control many of these insects. Infested nursery stock should be rejected.
Fruit-tree leaf roller.	Miscible oil for eggs. Arsenate of lead, 6 lbs. powder to 100 gals. water for larvae.	Miscible oil in early spring. Lead arsenate when buds are opening.	Codling moth spray helps. Do not spray when trees are in blossom as honey bees are injured.
Green apple aphis.	Prune infested shoots. Spray with tobacco extract, 2 pts. to 100 gals. water.	When insects appear and before leaves curl. Prune after leaves curl.	Kerosene emulsion and soap solution are recommended also.
Apple curculio.	Destroy hibernating places. Cultivate soil. Arsenate of lead, 3 lbs. to 100 gals. water.	Spray after petals fall.	The spray for codling moth will control this insect. In some cases it will be well to destroy wild hawthorns.
Apple leaf hopper.	Nicotine sulphate, 1 pt. to 100 gals. water. Dip nursery stock in soap solution.	Early in season before wing stage appears.	The insects stay under surface of leaves; therefore, hit the under surface with spray.
Bud moth.	Arsenate of lead, 3 lbs. to 100 gals. water.	When buds are bursting.	This insect has been reported in the northern end of the district only, but it is spreading.
Leaf blister mite.	Lime sulphur, 10 to 100. Miscible oil, 6½ to 100.	Dormant season until buds open.	This insect lives under a blister on the leaves and cannot be controlled in the summer.
Apple-tree borers. (1) Round headed. (2) Flat headed.	Keep trees vigorous. Dig larvae out before they enter the heart wood. Prevent egg laying on trunks by painting with pure white lead and linseed oil.	Paint before June 1.	Carbon disulphide may be effective if injected into holes and the holes then plugged.
Fire blight.	See Fire Blight under pears.		This disease does more damage on pears.
Blue mold.	Avoid bruising and wounding apples. Do not pile apples in storage. Keep temperature low (32-33 degrees Fahrenheit) in storage.	When picking and storing.	Blue mold is a storage disease, and does much damage under improper conditions.
Apple scab.	Lime-sulphur, 1 gal. to 40 gals. water, or copper sulphate, 4 lbs. to 45 gals. water.	Just before buds open.	This disease is not very troublesome in the Rocky Mountain region because of dry climatic conditions.

PEARS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Pear or cherry slug.	Arsenate of lead, 3 lbs. to 100 gals. water. Nicotine sulphate, 1 part to 800 parts water.	When insects appear.	Due to the delicate covering of this insect, it can be controlled by contact sprays as well as stomach poisons. Codling moth spray is usually sufficient.
Codling moth.	Same as for apple.		
San Jose scale.	Same as for apple.		
Leaf blister mite.	Same as for apple.		This insect is very bad on pears some years.
Fire blight (pear blight).	Prune out all infected branches, making cuts a few inches below darkened area. Sterilize pruning tools and wounds with mercuric cyanide, 1 part to 1000 parts of water by weight. Avoid too rapid growth of trees by proper cultural methods.	In winter and in summer when infected branches are observed.	This disease has exterminated many Bartlett pear orchards in this region. Planting resistant varieties is recommended.

PEACHES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Peach tree borer.	Apply paradichlorobenzene at base of tree, ½ to 1½ ozs. per tree, depending on age.	Early September.	This treatment has practically superseded the method of digging out the larvae or the shielding of the trunks with paper and wire.
Peach twig borer.	Lime-sulphur, 1 to 9. Arsenate of lead, 3 lbs. to 100 gals. water.	Use lime-sulphur in spring before buds burst. Arsenate of lead as buds are bursting and as fruit is maturing if insects are numerous.	Trees kept in vigorous condition are not much bothered.
Green peach aphis.	Tobacco solution, 2 pts. to 100 gals. water.	As soon as insects appear in spring or early summer.	This insect spreads to other crops, hence it is important to spray before migration.
Black peach aphis.	Dip nursery stock in strong tobacco solution. Spray leaves with tobacco solution. Apply tobacco solution or tobacco dust at base of tree and on exposed roots.	To nursery stock when planted. Spray leaves when aphids appear. Treat roots in early summer.	This insect does most damage to the roots. Some, however, attack the leaves during the early growing season.
California peach blight.	Prune cankers out. Lime-sulphur, 1 to 8 (dormant). Bordeaux mixture, 6-6-50, or lime-sulphur, 1 to 40.	Prune in spring and as cankers appear. Spray as soon as harvested and early in spring.	This disease is prevalent in a few places only.
Peach leaf curl.	Lime-sulphur, 1 to 8.	Before buds open in spring.	It is seldom necessary to spray for this disease.

CHERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Cherry or pear slug.	See pear insects.		This insect is extremely injurious, but is easily controlled.
Black cherry aphis.	Treat same as black peach aphis.		It is sometimes advisable to prune out colonies on shoots.
Shot hole disease (leaf blight).	Lime-sulphur, 1 to 50.	After the fruit has set.	Not serious in the Rocky Mountain district.

PLUMS

What to Spray For.	Treatment.		Remarks.
Pear or cherry slug.	See pear insects.		Plums are practically free from pests in this district.

APRICOTS

What to Spray For.	Treatment.		
Peach twig borer.	See peach insects.		

STRAWBERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Strawberry leaf roller.	Arsenate of lead, 3 lbs. to 100 gals. water.	When adult moths appear in spring.	If pest is very troublesome, cut vines and burn after crop is harvested.
Strawberry crown girdler.	Rotation of crops. Plow up patch when badly infested.	After crop is harvested.	In some cases it is advisable to plow up patch after first crop. If insects are not numerous, the patch may be left 3 or 4 years.
Strawberry root aphis.	Scatter straw over plants in early spring and burn. Plow up old infected patches.	After eggs hatch and aphis appear in spring.	Proper rotation of crops will keep this insect fairly well in check.
White grubs.	Proper crop rotation.	When necessary.	There is no means of control by spraying or addition of chemicals. If grubs are bad, strawberries should not follow sod.
Chlorosis (yellow leaves).	Plant in soil that does not cause leaves to turn yellow.		The cause of chlorosis is not definitely known. It may be due to many things.

GRAPES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Downy mildew.	Spray with Bordeaux mixture 5-5-50.	Just before blossom buds open.	Not often virulent in this district. It is very seldom necessary to spray.
Black knot (crown gall).	Prune out infected branches. Plant resistant varieties.	Prune during dormant seasons.	This disease attacks chiefly the European varieties.
Dead arm.	Prune out infected branches. If badly infected, remove vines. Take cuttings from disease-free vineyards.	During growing seasons when effects of disease can be observed.	In pruning, the cuts should be made some distance below infected area. If disease becomes bad, spread may be checked with Bordeaux mixture.
Phylloxera.	Graft European varieties on American stocks.	If phylloxera is bad, grafting should be done before establishing the vineyard.	In many cases the phylloxera is not bad enough to bother with.

INSECTS THAT FEED PROMISCUOUSLY

What to Spray For.	Treatment.	When to Treat.	Remarks.
Buffalo tree hopper.	Clean cultivation. Burn pruned wood.	Cultivate in early spring so as to keep all weeds down. Prune and burn wood in early spring.	This insect does damage to fruit trees by making punctures in which to lay eggs.
Woolly aphis (plant lice).	Nicotine sulphate, 1 pt. to 100 gals. water, or 15% kerosene emulsion.	When aphids appear in spring and before leaves curl.	In some cases it may be well to prune out infected shoots after leaves curl.
Grasshoppers and crickets.	Tear up breeding grounds with disk or spring tooth harrow. Scatter arsenic-bran mash in infested fields.	When they become numerous.	Traps may be used to good advantage some years.
Clover mite.	Lime-sulphur solution. Same as for San Jose scale.	During dormant season.	San Jose scale treatment destroys the eggs of this mite. It feeds on clover and various fruit trees.
Red spider.	Concentrated tobacco solution. 2 pts. to 100 gals. water or clear cold water.	When spiders first appear.	It is effective to use 3 lbs. of soap per 100 gals. of spray.
Tent caterpillar.	Prune out and burn tent masses. Arsenate of lead 3 lbs. to 100 gals. water.	In early growing season when caterpillars appear.	These insects are fairly well controlled by natural enemies.
Powdery mildew.	Lime-sulphur 1 to 8. Prune and burn infested shoots. Bordeaux mixture.	In dormant season. In summer as disease appears. In summer.	This is the only important disease that attacks various plants.
Putnam's scale.	Same as for San Jose scale, under "Apple."		

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Old and New Facts About Peach Leaf Curl

By G. H. Coons
Michigan Agricultural College

PROBABLY no disease of peaches is better known to growers than leaf curl. From the very beginning of the peach industry in America, leaf curl has annually presented a story, in this district or that, of defoliated trees and shortened crop. Attendant on peach leaf curl is impoverishment of trees and added susceptibility to winter injury.

There are few peach growing areas in the United States that are free from this disease, and those areas especially suited for peach production are in certain years severely affected by the curl epidemic. The areas where curl is most frequent are those located near large bodies of water. The peach industry has grown up in such situations because of the tempering effect of the lakes, etc., on the fluctuations of temperature, but these areas are by the same token subjected to long periods of cold, wet weather in the spring which greatly augment leaf curl. The fruit grower, be he located in Michigan, California, New York, or Georgia, must take leaf curl as a hazard in his business and prepare to prevent its ravages.

Conditions Which Favor Leaf Curl

Leaf curl is a disease which varies in its intensity with the season. Comparative freedom one season does not mean that loss will not come the next. The outbreaks cannot be foretold—all that can be said is that if the spring is delayed, if cold, wet weather predominates as the first growth is pushing out in the spring, leaf curl will be severe. When it does appear, nothing can be done—the loss must be taken and with it some high resolves of "never again" to neglect the proper preventive treatment.

Twigs of peach from sprayed and unsprayed trees, illustrating the control of peach leaf curl. No. 2 sprayed with winter strength lime and sulphur

As has been said, leaf curl is an old enemy and until recently, one about which there was little known. It is a fungous disease, and the discovery of its control for a long time compassed our knowledge of the disease and the parasite which causes it.

Early Investigations of Leaf Curl

The story of the early investigations of peach leaf curl is extremely interesting. The peach growers of California by accident, as they were combating San Jose scale, noticed that trees receiving the dormant spray remained free from curl. Various practical fruit growers made this observation in the period from 1885 to 1890, but aside from local reports, no announcement of the discovery was made.

(*Continued on page 46*)

ACRES of otherwise finest apples are quickly dwarfed, specked and only develop into culls where spraying for Aphis is neglected.

This tiny insect, which may appear at any time, is recognized as one of the most destructive foes of the orchardist. "Black Leaf 40," the "Old Reliable" nicotine sulphate, is true aphis insurance in orchard, garden and field. Costs only a few cents a tree.

Because of their manner of feeding, arsenical and similar sprays are wholly ineffective, not only against Aphis, but against Leaf Hopper, Red Bug, Pear Psylla, Thrips and a big list of other ruinous insects. All these are positively controlled by "Black Leaf 40."

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"Black Leaf 40" gives equally effective control whether used as a separate spray or with other standard solutions. Each spray retains its original efficiency. Thus you can usually make one spraying serve a double purpose.

Aphis infestation is likely to develop at any time after the buds begin to swell, so be prepared by having "Black Leaf 40" on hand to meet the emergency.

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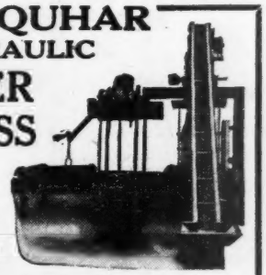

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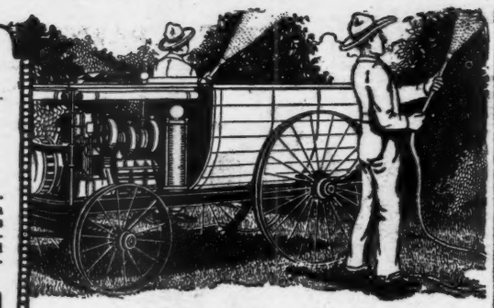

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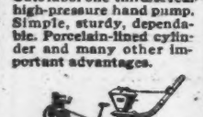

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1925 looks like a big year for the grower. Go in for every dollar your orchard will produce. An adequate spraying program is of first importance. Clean trees produce the *most* and the *best* fruit—and clean high-grade fruit always enjoys a better market and brings a better price than fruit that is inferior in quality and appearance.

A Good Spray Outfit is a Money-Maker

There's no use trying to get along with a rig that's too small for your acreage, or an unreliable makeshift sprayer that doesn't do good work. It's real economy to own a first-class outfit like the BEAN.

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High even pressure has a lot to do with results. Every Bean Sprayer, from the powerful Super-Giant with its capacity up to 23 gallons at 300-400 pounds pressure right down to the popular little Simplicity with a capacity of 5½ gallons a minute at 250 pounds pressure is built for *continuous high pressure work.* Every Bean is guaranteed to operate at full-rated pressure and to deliver full-rated capacity.

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BEAN
ORCHARD AND CROP
SPRAYERS

Spray Calendar

By T. J. Talbert,

APPLES, PEARS AND QUINCES

No. and Name of Spray, and When to Spray.	What to Spray For.	What to Use.
(1) Dormant or delayed dormant. Any time after the leaves drop in the fall and until the blossom buds begin to open in the spring. Generally most satisfactory just as buds are swelling.	San Jose scale and other scale insects.	Lime-sulphur 1 to 7, or lubricating oil emulsions, cold or boiled oil soap emulsion, 1½ to 50. Proprietary miscible oils at dilution marked on containers.
Special spray. When buds are opening and aphid eggs are hatching.	Plant lice (aphids). Only when serious.	Oil emulsion 1½ to 50, or nicotine sulphate ¾ pt. in 100 gals. lime-sulphur, diluted 1½ gals. to 50.
(2) First summer spray (cluster bud). When individual flower buds in the cluster begin to separate, but before they open.	Plant lice (aphids), apple scab, leaf spot, curculio, canker worm.	Lime-sulphur 1½ to 50 plus 1 lb. arsenate of lead. When aphids are abundant, add nicotine sulphate ¾ pt. to 100 gals. of spray mixture.
(3) Second summer spray (calyx). Start when bloom is two-thirds off and finish before the blossom ends close. Most important single summer spray. Should be applied within a week after petals fall to be most effective.	Codling moth, plant lice (aphids), apple scab, leaf spot, curculio, canker worm, lesser apple worm.	Lime-sulphur 1¼ to 50, plus 1 lb. arsenate of lead. When aphids are serious, add nicotine sulphate ¾ pt. to 100 gals. spray mixture. On account of danger of injury to fruit, Bordeaux should not be used earlier than 12 to 14 days after the calyx spray.
(4) Third summer spray. Within 12 to 14 days after calyx spray. If curculio injury is severe, apply within 6 or 7 days after calyx spray, using lime-sulphur 1¼ to 50 and 1½ lbs. arsenate of lead.)	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot.	Lime-sulphur 1¼ to 50 plus 1 lb. arsenate of lead. Where apple blotch or phoma spot is serious, use Bordeaux mixture (3-4-50) instead of lime-sulphur.
(5) Fourth summer spray. Apply 12 to 14 days after the preceding summer spray, or No. 4.	Apple blotch, curculio, codling moth, lesser apple worm, sooty blotch, phoma spot.	Lime-sulphur 1¼ to 50 plus 1 lb. arsenate of lead. If apple blotch or phoma spot is serious, use Bordeaux (3-4-50) instead of lime-sulphur.
(6) Fifth summer spray. Apply about 12 to 14 days after No. 5.	Codling moth, lesser apple worm, apple blotch, bitter rot, sooty blotch, curculio, phoma spot.	Lime-sulphur 1 to 50, plus 1 lb. arsenate of lead. If apple blotch, bitter rot, or phoma spot is serious use Bordeaux (3-4-50) instead of lime-sulphur.
(7) Sixth summer spray. Apply about 12 to 14 days after No. 6. Make later sprays at intervals of 10 days to 2 weeks, where apple blotch, bitter rot, or phoma spot is serious.	Codling moth, lesser apple worm, apple blotch, bitter rot, sooty blotch, curculio, phoma spot.	Same materials in the same proportions as for the fifth summer spray.

PEACHES

No. and Name of Spray, and When to Spray.	What to Spray For.	What to Use.
(1) Dormant spray. Any time after the leaves drop in the fall and before the buds swell in the spring.	San Jose scale, peach leaf curl.	Lime-sulphur 1-7, or oil emulsion, cold or boiled, at the rate of 1½ to 50 in 5-5-50 Bordeaux.
Special spray. Before the buds swell in the spring.	If scale is absent, for peach leaf curl.	Bordeaux 5-5-50 or lime-sulphur 5-50.
(2) First summer spray. Just as the husks fall from the young fruit or about 7 days after the bloom drops. Special spray. If curculio is serious repeat this spray in a week.	Curculio, brown rot.	1 lb. arsenate of lead and 3 lbs. freshly slaked lump lime to 50 gals. water, or if brown rot has been serious, use 8-8-50 self-boiled lime and sulphur or 12½ lbs. dry-mix sulphur lime to 50 gals. water, plus 1 lb. arsenate of lead.
(3) Second summer spray. About 10 to 12 days after No. 2.	Scab, brown rot, curculio.	Self-boiled lime and sulphur, 8-8-50, or 12½ lbs. dry-mix sulphur lime to 50 gals. water, plus 1 lb. arsenate of lead.
(4) Third summer spray. About 10 to 12 days after No. 3.	Scab, brown rot, Curculio.	Same materials in the same proportions as for the second summer spray.
(5) Fourth summer spray. About 10 or 12 days after No. 4.	Scab, brown rot, curculio.	Same materials in the same proportions as for the third summer spray.

Peaches—Where San Jose scale and peach leaf curl are absent, sprays Nos. 2 and 3 will generally be adequate for early peaches. For the best protection of the fruit on varieties like Elberta, Heath Cling and Krummel, 2 or 3 additional sprays applied at intervals of about 12 to 14 days may be required. This will be particularly true during wet seasons. It is important, however, that the spraying work be discontinued about 3 weeks before picking time to prevent marring the appearance of the fruit and having it discriminated against upon the markets.

Self-boiled lime and sulphur is one of the best and safest sprays for peaches. This is a special spray for peaches and Japanese plums. It should not be made up until it is desired to begin the spraying work. Self-boiled lime and sulphur should not be confused with commercial lime-sulphur or the home-made lime-sulphur. The only heat used in making the self-boiled lime and sulphur is that produced by the slaking of the stone lime.

CHERRIES AND PLUMS

(The following schedule applies to sour cherries and American plums.)

No. and Name of Spray, and When to Spray.	What to Spray For.	What to Use.
(1) Dormant spray. Just before the buds swell in the spring.	San Jose scale, cherry scale.	Lime-sulphur 1-7 when scale is present. If scale is absent, this spray is not required.
(2) First summer spray. Just before the blossom buds open.	Curculio, brown rot, leaf spot.	Bordeaux 3-4-50 or lime-sulphur 1½-50 and 1 lb. arsenate of lead.
(3) Second summer spray. Immediately after the petals fall.	Curculio, brown rot, leaf spot.	Bordeaux 3-4-50 or lime-sulphur 1½-50 and 1 lb. arsenate of lead.
(4) Third summer spray. 12 to 14 days after No. 3.	Brown rot, leaf spot, curculio.	Bordeaux 3-4-50 or lime-sulphur 1½-50 and 1 lb. arsenate of lead.
(5) Fourth summer spray. Soon after picking the fruit.	Leaf spot, leaf-chewing insects.	Bordeaux 3-4-50 or lime-sulphur 1½-50. If leaf-chewing insects are present, add arsenate of lead 1 lb. to 50 gals. of spray

Sour Cherries—In orchards where the fungous diseases known as brown rot and leaf spot do not occur, all the sprays as outlined above will not be needed. Since these diseases are so common in mature cherry orchards, it will generally pay to apply all the sprays as outlined.

Sweet Cherries—Bordeaux should never be used in spraying sweet cherries on account of the danger of the mixture doing severe injury to the fruit and foliage. Otherwise sweet cherries should receive the same treatment as sour ones, except the lime-sulphur solution should be used at the rate of 1 to 50 instead of 1½ to 50, to reduce the liability of injury from the spray mixture.

Additional summer sprays may be required to control brown rot if the season is wet. More sprays will also be required if curculio is serious. Where this is true, the sprays containing lime-sulphur and arsenate of lead should be applied at intervals of about 10 days. It is important, however, that the spraying work be discontinued at least 3 weeks before picking time to prevent marring the appearance of the fruit.

Plant lice (aphids) frequently do damage to plums and prunes. When this pest is serious, add ¾ pt. nicotine sulphate to every 100 gals. of the spray mixture.

Japanese Plums.—For the Japanese varieties of plums, such as Burbank, Abundance, Chebot, etc., self-boiled lime and sulphur 8-8-50 should be substituted for the concentrated lime-sulphur solution. Atomic sulphur or dry-mix sulphur lime may be used in spraying Japanese varieties of plums without danger of injury.

for the Middle West

University of Missouri

GRAPES

No. and Name of Spray, and When to Spray.	What to Spray For.	What to Use.
(1) Dormant spray. A few weeks before growth starts in the spring.	Grape scale, San Jose scale, anthracnose, black rot.	Lime-sulphur 1-7 for both scale and anthracnose. If scale is absent, for anthracnose and black rot use Bordeaux 8-8-50.
Special bud spray. As buds are swelling. Repeat in 5 to 7 days.	Grape flea beetle.	Arsenate of lead 3 lbs. to 50 gals. water.
(2) First summer spray. When shoots are showing second or third leaf.	Black rot, anthracnose, flea beetle, rose chafer.	Bordeaux 4-4-50 and arsenate of lead 3 lbs.
(3) Second summer spray. Just before blossoms open	Black rot, anthracnose, curculio, flea beetle, berry moth, Rose chafer.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.
(4) Third summer spray. As soon as the bloom is off and the fruit is set.	Black rot, anthracnose, curculio, berry moth, downy mildew, powdery mildew.	Same as for second summer spray.
(5) Fourth summer spray. From 10 to 14 days after the third summer spray.	Black rot, anthracnose, downy mildew, powdery mildew, grape root worm.	Same as for third summer spray.
(6) Fifth summer spray. From 10 to 14 days after the fourth summer spray.	Black rot, anthracnose, chewing insects.	Same as for fourth summer spray.
(7) Sixth summer spray. From 10 to 14 days after the fifth summer spray.	Black rot, other diseases and insects, if any.	Same as for fifth summer spray.

Lime-Sulphur is not used as a summer spray for the grape because it damages the fruit and burns the foliage.

Thorough spraying and timely applications are required in successful grape culture. More beginners in commercial grape growing fail on account of improper spraying than from any other cause.

PROPER USE OF LUBRICATING OIL EMULSIONS

Oil emulsions have been used in Missouri for 3 years as dormant sprays for San Jose scale control. They are not recommended as foliage or fruit sprays. When directions for preparing, diluting and applying oil emulsions as a dormant spray are strictly followed, we believe that they are effective in controlling scale. Two per cent of oil is the strength recommended as a dormant spray. Remember also that free oil, which may rise out of an improper emulsion, or from the diluted spray mixture, is liable to cause injury to fruit trees. If free oil does rise, the emulsion is not safe to use. Consult Missouri Experiment Station Circular 109 and Bulletin 216 on preparing oil emulsions. Do not spray free oil on trees. For best results, a good emulsion must be maintained at all times. Lubricating oil emulsion is not fool-proof; but, if properly prepared and applied when weather conditions are favorable for dormant spraying, experience to date shows it to be safe. This also applies to the commercial oil emulsions and miscible oils on the market.

Some have had injury and poor scale control from the use of improperly prepared and applied oil sprays, so we urge strongly, careful preparation of the oil emulsion sprays. Injury has been reported from the use of oil sprays similar to lubricating oil emulsion, when applications were made immediately before periods of cold weather. Some also fear possible cumulative injury where dormant applications are repeated several years in succession. Experiments are now under way at the College of Agriculture which will determine whether such injury is likely.

POINTS TO BE REMEMBERED

The lubricating oil emulsions are not recommended as fungicides. There is no evidence that they have any fungicidal value. When mixed with Bordeaux 3-4-50, however, the combination spray becomes a fungicide as well as an insecticide.

(1) For the effective control of scale either liquid lime-sulphur, the lubricating oil emulsions, or miscible oils may be used. If there is any slight advantage in the matter of scale control, it is on the side of the oils.

(2) From the point of view of scale control alone, the lubricating oil emulsion sprays are the cheaper.

(3) From the point of view of possible injury to the fruit trees, lime-sulphur has a decided advantage as it has never caused injury when applied on dormant trees. However, the oil emulsions are being used extensively for dormant sprays, and if the emulsions are properly prepared and diluted, evidence to date points to the fact that they can be safely used on dormant trees.

(4) Use ¼-¼-50 Bordeaux with every tank of engine oil-soap emulsion. Stock emulsions in which free oil has separated out and come to the surface, due to freezing or any other cause, should not be used. Do not use a dilute spray mixture in which free oil has separated out and come to the surface of the tank. Stir all stock emulsions before measuring out for use. If you make your own emulsions, follow directions carefully, especially instructions to use a pump giving good pressure. The pressure given by a hand pump can usually be increased by decreasing the size of the opening of the nozzle.

(5) Careful experiments and observations in Missouri have shown that San Jose scale can be effectively controlled with lime-sulphur, lubricating oil emulsions and miscible oils. A very thorough application is necessary and each spray must be used at the proper dilution. As many growers have failed to control scale with the oil sprays as with the lime-sulphur spray. It is not, therefore, so much a matter of which spray to use as it is of thorough spraying at the right dilution. One good dormant application each year should keep the scale well under control and prevent injury to the fruit and trees.

COMBINATION SPRAYS INCLUDING OIL

The Missouri Agricultural Experiment Station has been able to combine the dormant and first summer or pink spray for apple orchards. In so doing time, labor, and the cost of equipment for making one spray can be saved. The results obtained during the past 2 years have been satisfactory. From these results the indications are that the grower may wait to apply the dormant spray until the period for the pre-cluster bud or cluster bud application. A 2% cold lubricating oil emulsion may then be added to the lime-sulphur or Bordeaux arsenate of lead at summer dilution and the combination spray used for the control of all the insect pests and fungous diseases injurious to the foliage and fruit buds at that time. The main pests to be combated at that period are San Jose scale, aphids, curculio, canker worm, apple scab and black rot leaf spot.

A Bordeaux-oil-arsenate of lead spray, consisting of Bordeaux made according to the 3-4-50 formula, a 2% cold lubricating oil emulsion, and 1 lb. of dry arsenate of lead was used in one set of experiments. In another, lime-sulphur, oil, arsenate of lead, consisting of lime-sulphur 1½ to 50, a 2% cold lubricating oil emulsion and 1 lb. of dry arsenate of lead were employed. The investigations have been made during two seasons, 1923 and 1924. The sprays were applied at different periods, ranging from the time of the appearance of the first green leaves until after the cluster buds separated but before the blossoms opened.

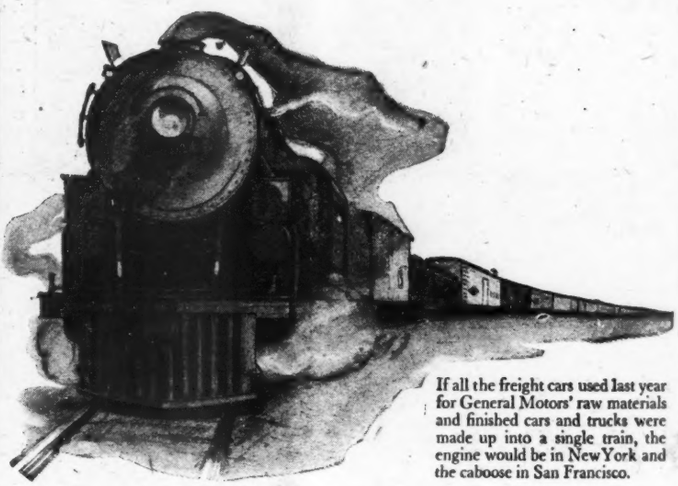
No material injury has so far been done to the young foliage or opening fruit buds. The tips and margins of the young apple leaves generally showed more browning or burning as a result of the application of lime-sulphur, oil, and arsenate of lead than with the use of Bordeaux, oil, and arsenate of lead. Careful observations have shown that no fruit buds were destroyed and the injured leaves were soon replaced by new ones.

Sucking insects like San Jose scale and aphids have been effectively controlled at the pre-cluster bud and cluster bud periods. The spray has also controlled chewing insects like curculio and canker worms. Being a fungicide, it has also been effective in the control of such fungous diseases as apple scab and black rot leaf spot. This spray has been very effective in the control of aphids, especially when applied immediately following the hatching of the aphid eggs. This period usually occurs shortly after the appearance of the first green leaves.

Where the grower decides to combine the dormant and first summer spray, it is important that he start the spraying work in time to finish before the blossom or flower buds open as the fruit and foliage are often seriously injured by the application of oil sprays after the cluster bud period. It is also important for best results that the oil emulsion, which is used for the control of such sucking insects as San Jose scale and aphids, be applied not later than the period between the appearance of the first green leaves and the opening of the first flower buds.

The addition of the oil to summer strength lime-sulphur or Bordeaux may often be desirable because the grower may neglect or be unable to apply the dormant spray until after growth starts. Where this combination spray is used it is imperative that the spraying machinery and accessories be in first-class condition and that sufficient materials be on hand to make the application. If delays occur the trees are apt to come into bloom before the spray can be applied to the entire orchard. The cluster bud or pink spray should generally be applied within a period of about 7 days, and the spraying work should cease while the trees are in bloom.

FACTS ABOUT A FAMOUS FAMILY



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The car and truck factories of General Motors used 340,337 freight cars in 1923 to bring in raw materials and to take away finished automobiles.

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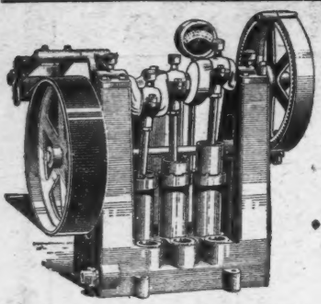

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For all field and row crops. Light draft. Adjustable wheels.

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HAYES "FRUIT-FOG" SPRAYERS

Spray Calendar

By F. N. Fagan,

APPLES

Time.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
TREES DORMANT or DELAYED DORMANT.	Lime-sulphur testing out of sprayer 1.03 Sp. Gr.	San Jose Scale.
Leaves of first buds showing about ¼ in.	Lime-sulphur testing out of sprayer 1.03 Sp. Gr. Tobacco Extract (40 per cent nicotine) 1 qt. Powder arsenate of lead 6 lbs.	San Jose, Oyster or Scurfy Scales. Aphis. Bud moth. Leaf-rollers and other eating insects.
Pink. When flower cluster buds are separating.	Lime-sulphur testing out of sprayer 1.008 Sp. Gr. Tobacco Extract (40 per cent nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Apple Scab, Frog-eye, Mildew. Aphis—any early red bug. Bud Moths — Leaf-rollers, Curculio.
Petal Fall. When petals have nearly all fallen from flowers.	Lime-sulphur testing 1.008 Sp. Gr. Tobacco extract (40 per cent nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Scab, Frog-eye, Mildew. Aphis, Red Bug if not under control. Codling moth, Curculio and any other eating insects.
Two weeks after Petal Fall spray. Apples well formed.	Repeat Petal Fall spray. Substitute Bordeaux Mixture for lime-sulphur in sections where Apple Blotch and Bitter Rot are pests.	Apple Scab, Frog-eye, Apple Blotch. Codling Moth, Maggot, Aphis, Red Bug.
*Extra Spray. For use in sections infested with Apple Blotch and Bitter Rot. Four weeks after Petal Fall spray.	Bordeaux Mixture, 16-16-200. (If eating insects are not under control use 6 lbs. powder arsenate of lead.) (If Aphis not under control use nicotine in this spray same as in Petal Fall spray.)	Blotch and Bitter rot. Codling moth.
Mid-Summer Spray. Late July or early August, depending upon season. Time it for second brood codling moth.	Repeat Petal Fall spray. Nicotine not necessary unless aphis are not under control. Substitute Bordeaux Mixture for the Lime-sulphur in sections where Blotch and Bitter Rot are found as pests.	Late infection scab—Fruit spot—Sooty and Fly speck fungus—Bitter rot. Codling moth and other eating insects.

In sections where Lime-sulphur solution burns foliage and fruit Self-boiled Lime-sulphur can be substituted.

CHERRIES

DORMANT.	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer. Miscible oil sprays as recommended by the manufacturer.	San Jose and related scales. Lecanium and related scales.
*Extra spray. When first new leaves show aphis present.	Tobacco Extract (40 per cent nicotine) 1 qt. and 4 to 6 lbs. of soap in solution.	Aphis.
Petal Fall. After petals have fallen.	Self-boiled Lime-sulphur 32-32-200. Powder arsenate of lead 6 lbs.	Brown rot, Leaf Spot, Mildew. Curculio.
When calyx shucks are just off the green fruit.	Self-boiled Lime-sulphur, 32-32-200. Powder arsenate of lead, 6 lbs.	Brown rot, Leaf Spot, Mildew. Curculio.
*Just before fruit turns color.	Self-boiled Lime-sulphur. Powder arsenate of lead, 6 lbs.	Brown rot, Leaf Spot, Mildew. Fruit fly, early slugs.
Late summer foliage spray. After fruit is harvested.	Self-boiled Lime-sulphur. Powder arsenate of lead, 6 lbs.	Leaf Spot. Cherry Leaf slug.

*This spray may often be omitted.

GRAPES

When new shoots are 6 to 14 ins. long. Before flower buds open, but after flower bud clusters are well formed.	Bordeaux Mixture, 16-16-200. Powder arsenate of lead 6 lbs.	Mildew. Anthracnose. Black Rot. Flea beetles — early Rose chafer and Berry moth.
Just after flower buds have bloomed and young fruit has set.	Bordeaux Mixture, 16-16-200. Powder arsenate of lead 6 lbs.	Mildews. Anthracnose. Black Rot. Flea beetles, Root worm, Rose chafer, Berry moth.
Ten days to 2 weeks later.	Bordeaux Mixture, 16-16-200. Powder arsenate of lead 6 lbs. (If any leaf hoppers are present in nymph stage add 1 qt. of 40 per cent Nicotine.)	Mildews. Rots. Any eating insects.
Two weeks later.	Bordeaux Mixture, 16-16-200. (If eating insects not under control add powder arsenate of lead 6 lbs.) (If leaf hopper nymphs are present add 1 qt. of 40 per cent Nicotine.)	Rots. Mildews.

*Special Leaf Hopper Spray—This insect often becomes a serious pest. It can be controlled by spraying when the hoppers are in the nymph stage by using 1 qt. of 40 per cent nicotine in combination with the above sprays, or by special sprays using the nicotine with 4 to 6 lbs. of soap in solution. The nymph stage is when hoppers are young and cannot hop or fly.

A New and Effective Dust for Apple Aphis and Pear Psylla

Cyanogas (Calcium Cyanide) has been developed to meet the need of farmers for a more effective insecticide for use against Apple Aphis and Pear Psylla. On coming into contact with air, it releases hydrocyanic acid gas which reaches these pests and kills them.

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FREE Descriptive pamphlets of this labor saver and name of nearest dealer sent FREE. Write today to

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Pennsylvania State College

PEACHES

Time.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
DORMANT. Before buds swell at all.	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale. Peach Leaf Curl.
*Special DORMANT. For lecanium and related scale insects.	Miscible oil such as "Scalecide." Strength as recommended by the manufacturer.	Lecanium and related scale insects.
When little peaches are pushing out of calyx shucks.	*Self-boiled Lime-sulphur, 32-32-200.	Peach scab. Brown Rot.
Shucks may be dropping.	Powder arsenate of lead 6 lbs.	Curculio.
Three weeks later.	Repeat last spray.	Peach Scab. Brown Rot. Curculio.
Three to four weeks before fruit ripens.	Self-boiled lime-sulphur, 32-32-200.	Brown Rot

Oriental Peach Moth—This pest is becoming more common and if a grower had the moth in his 1924 peach crop he should take up the subject of its control in 1925 with his state experiment station.

*Dry-mix Sulphur Lime may be substituted for self-boiled—2 lbs. calcium caseinate, 16 lbs. hydrated lime, 32 lbs. superfine sulphur. Mix dry before placing in 200-gal. sprayer.

PEARS

DORMANT.	Lime-sulphur testing 1.03 Sp. Gr.	San Jose Scale.
Pink or Flower bud.	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
When flower buds separate in cluster.	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Psylla, Aphis. Any eating insects.
Petal Fall.	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
After petals have fallen.	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Psylla, Aphis. Codling Moth, early slugs.
Fruit Cluster spray about 2 weeks after petal fall. When young fruits stand in open cluster.	Lime-sulphur to test 1.008 Sp. Gr. Powder arsenate of lead 6 lbs.	Scab, Leaf Spot, Black Spot, Black Rot. Codling Moth, slugs.

Special Sprays Needed to Fight Pear Psylla. Nicotine 1 qt. to 200 gals. and 4 to 6 lbs. of soap in summer months to kill nymphs. The nymph stage is when hoppers are young and cannot hop or fly. Miscible oil sprays as recommended by manufacturers on warm days in late winter will aid by killing adults.

PLUMS

DORMANT.	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale.
	Miscible oil sprays as recommended by the manufacturers.	Lecanium and related scales.
When little plums are pushing out of calyx shucks. Shucks may be dropping.	Self-boiled lime-sulphur, 32-32-200. Powder arsenate of lead 6 lbs. (Tobacco extract, 40 per cent nicotine, should be used if aphis are present.)	Brown Rot, Leaf Spot, Mildews. Curculio.
Two weeks later.	Self-boiled lime-sulphur, 32-32-200. Powder arsenate of lead 6 lbs.	Leaf Spot, Brown Rot, Mildews. Curculio.
Fruit Spray. Two to three weeks before harvest.	Self-boiled lime-sulphur.	Brown Rot, Leaf Spot, Mildews.

*Bordeaux mixture 16-16-200 can be used in place of self-boiled lime-sulphur on European varieties. Self-boiled lime-sulphur is more safe on Japanese varieties.

SPRAY CALENDAR

1. To secure the specific gravity of lime-sulphur as recommended in this calendar, test the concentrated lime-sulphur solution with a specific gravity hydrometer. Divide the decimal part of the concentrate reading by the decimal of the desired spray. The result shows the total dilution required. Example, concentrate testing 1.27 sp. gr. and desired spray is 1.03 sp. gr., dividing .27 by .03 gives 9. Nine is the total dilution required; thus one would use 1 gal. of a concentrate testing 1.27 sp. gr. and 8 gals. of water to get a spray testing 1.03 sp. gr.

2. Know what pests you are trying to control.

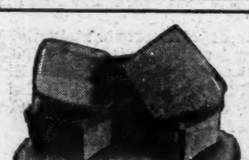
3. Know you are using the right materials, applying them at the right time and doing a complete job of spraying.

4. Be sure your sprayer engine has power enough to give you good pressure. Two hundred and fifty pounds is not too much pressure if using spray gun, more will do no harm.

5. If using spray gun, do not shoot direct with the solid spray.

6. In making Bordeaux Mixture, have both the lime solution and the copper sulphate solution in their full dilutions before mixing them. Place one solution in sprayer, start the engine and then add the other solution.

7. In making self-boiled lime and sulphur, slack lime slowly, when partly slacked add sulphur, allow to beat until brown streaks appear slightly and then stop cooking by adding rest of cold water.



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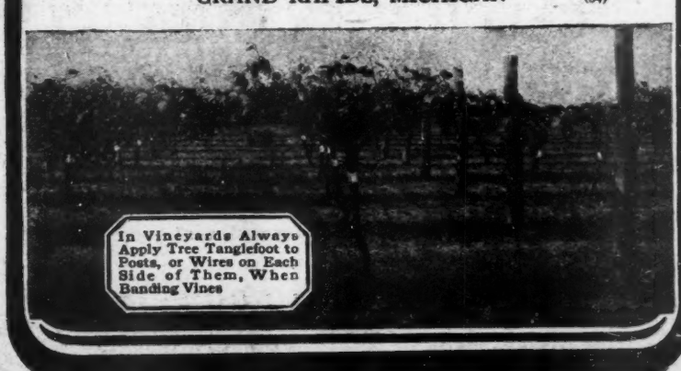

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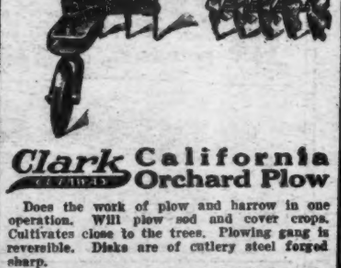

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The Cutaway Harrow Company

130 Main St. Higganum, Conn.

Shot Hole or Bacterial Spot of Peach

(*Continued from page* 26)

tree to such an extent that growth ceases for a while, and then in response to rains or the application of fertilizers growth is renewed later in the season. Such irregular growth is extremely hard on the tree.

Varietal Susceptibility

A large number of varieties are more or less susceptible to the shot hole, and none are entirely immune. Unfortunately, the two varieties most extensively grown, the Elberta and J. H. Hale, are both quite susceptible. Of these two there is little question but that the J. H. Hale is by far the more susceptible. This is especially true of the fruit. Leaf infection is frequently worse on the Elberta.

One season when shot hole was moderately severe on the Elbertas and Hales in the University of Illinois variety orchard, I observed none on any other variety. In southern Illinois in 1923, where the disease was very severe on these two varieties, I observed an orchard of Champion which was entirely free. This was true also in the university orchard, where a number of Champion trees were used as replants in a Hale orchard.

Overwintering

The bacteria are thought by some to live over winter in cankers in the one-year-old wood. In Illinois, however, I have not been able to find any cankers which harbor the bacteria. Others claim that the buds harbor the bacteria, but in spite of repeated efforts I have been unable to isolate the germs from buds taken from severely diseased trees. I am of the opinion, therefore, that some other place of hibernation will ultimately be found.

It is important to know where the bacteria spend the winter, since this will probably give us a clew as to the best methods of control. For example, if the hibernation takes place on the leaves underneath the trees, thorough cultivation early in the spring might aid in control. Or if hibernation occurred on wild plums, the destruction of these might reduce the chances of infection.

Will Nitrating Control the Disease?

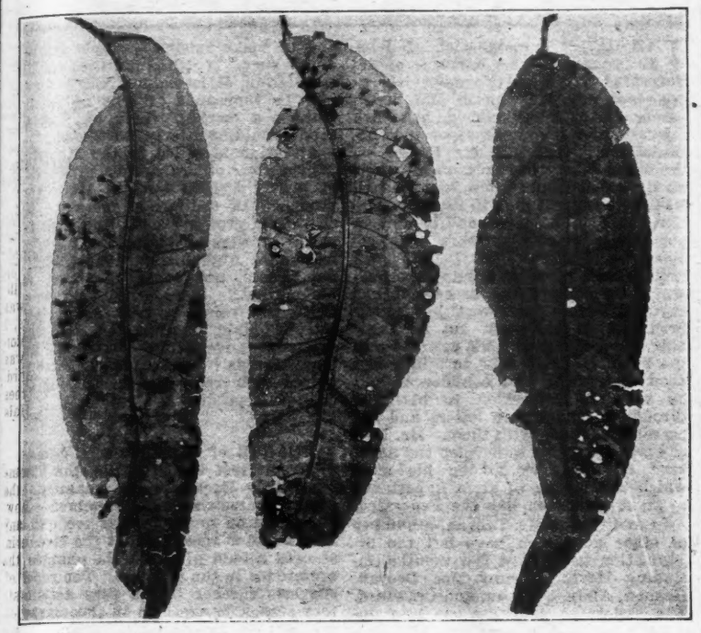
The method of control of bacterial shot hole ordinarily recommended is the application of sodium nitrate and cultivation. Can we depend upon this method for the control of this disease in the future?

Unfortunately the experience of the past five or six years has taught us that *nitrating with cultivation cannot be depended upon to control bacterial shot hole.* It is true that in many instances this method of treatment has given apparently good results, but in other cases it has fallen down disastrously. These differences in results have been obtained in the same year on the same varieties and on trees of approximately the same age and state of vigor. I might cite here the experience of Guy Beauman at Tunnel Hill, Ill., where I have made numerous observations and am familiar with the history of the orchard. It might be pointed out that Mr. Beauman has followed the advice of the station in regard to the proper treatment of his orchard. It is by no means the only instance in which failure to control bacterial shot hole has occurred when nitrating was practiced.

Mr. Beauman's orchard is planted to Hale and Elberta. The trees are about seven years old and have had excellent treatment as to cultivation and nitrating from the time of planting the orchard. In 1924 he had a fair crop on both the Elbertas and the Hales. The orchard was nitrated four times. The dates of application were April 1, May 15, June 1 and June 20, with one pound of nitrate per tree for each application. Thorough cultivation was practiced throughout the sea-

son, starting as soon as the weather permitted.

Bacterial shot hole started rather early in this orchard and appeared on both the fruit and the leaves. The Hales were especially severely attacked. The fruit of this variety showed at least 90 per cent infection, and there was at least 75 per cent severe infection. The leaves of both Hale and Elberta showed nearly 100 per cent infection before the fruit was harvested. Partial defoliation resulted before the fruit was harvested, and most of the leaves were off the trees in the latter part of August.



Peach leaves showing injury from shot hole fungus

While it is true that many nitrated orchards suffered severely, it is also true that in many cases those orchards which were nitrated showed much less defoliation than those not nitrated. I do not wish to take the attitude that nitrating does not help the orchard so far as bacterial shot hole is concerned. On the other hand, I believe that in many cases this treatment has been of great value. But I do desire to emphasize the fact that nitrating is not a *reliable* method of controlling shot hole and that until we get more information concerning the reason for the numerous failures, we cannot recommend this method with any degree of confidence. The method should not be discarded altogether. Rather, we should make a very exhaustive study of the subject and try to determine the factors involved. If the disease *can* be controlled by cultural methods, it will certainly be a great saving to orchardists, for even if a spray material is secured which will control the disease, the chances are that the spraying will have to be an almost continuous process throughout the latter part of the season, and this will be expensive in the extreme.

Suggestions for Control

My observations during a number of years lead me to believe that certain conditions of growth of the trees should be maintained in order to give best control. I am not certain that these directions, if followed, will give any better control than any other methods, but I am certain if I owned a peach orchard I would use this treatment.

1. When planting a new orchard, be sure that the trees in the nursery are free from bacterial shot hole. If one is planning to plant a large orchard, it certainly pays to see the trees in the nursery rows. If you cannot visit the nursery yourself, try to interest the nursery inspector in the state where you buy your trees so that he will make the inspection for you. This inspection should be made as late in the season as possible, but when the foliage is on the trees.

2. During the first or second year in the life of the orchard, a heavy crop of legumes should be plowed under.

3. The trees should be pruned in such a way as to keep them fairly open. I believe that a certain amount of summer thinning of branches would help. The object here is to allow the leaves to dry as soon as possible.

4. The trees should be so treated as to promote an *even* growth throughout the season. For this reason I believe in the application of nitrate late rather than early, and at different intervals rather than all at one time. Just how these applications should be spaced and the amount of each I am not prepared to state, but in my own orchard I would watch the growth of the twigs and as soon as it appeared that growth was slowing down noticeably, I would make another application.

5. Cultivation early in the season should take the place of nitrate, and cultivation later should be spaced so as to supplement the nitrate. Just how often one should cultivate and how often one should nitrate would depend upon the way the trees were behaving.

6. Manure should be applied in the fall or winter. This tends to promote an even growth.

Fresh Fruits Help Teeth

DENTISTS now come to the front with authoritative statements that fresh fruits are the best desserts for the teeth and that they act as a dentifrice. Pastry and other sweets are well known to be not so good for the teeth.

Fresh fruits have a cleansing effect on the teeth, the dentists say, not only because of their cellulose fibers but also because the vegetable acids they contain stimulate a flow of saliva which keeps the mouth clean. Fruit juice in infancy is known to be a valuable adjunct to the proper development of the teeth and continued through childhood to furnish the sweets for which the youngsters crave instead of candy keeps up the work of keeping the teeth sound, and continued into adult life serves the excellent purpose of keeping them clean and sound.—*Illinois State Horticultural Society.*

AMERICAN FRUIT GROWER MAGAZINE: Please add the accompanying 12 names to the list of subscribers to your splendid magazine for three years. Please make the subscriptions begin with the January number. We enclose check for $12 to pay for same.—*H. D. Simpson, Vincennes, Ind.*

Deming

PUMPS THE WORLD'S BEST

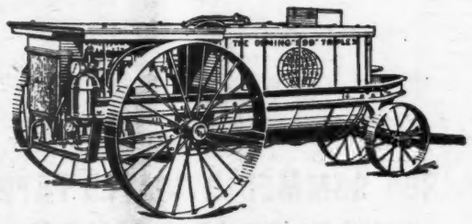
SPRAY PUMPS

THERE is no profit in purchasing a spray outfit unless you *know* that outfit is going to do the job right.

Deming Spray Pumps are built to do the job right!

Every Deming Spray Pump, from a small bucket sprayer to a big power sprayer can be depended upon to give you lasting service and satisfaction.

The Deming Spray Pumps illustrated here are but part of a complete line built for every spraying requirement. It will pay you to learn how Deming Spray Pumps can *best serve* you before you invest in any spraying equipment.



The Deming "999" Triplex Power Spray Outfit
Is operated by a model "T" Ford Engine. Capacity: 25 gallons per minute. Pressure: 400 pounds. Tank capacity: 300 gallons.

The "New Victory"
5 H. P. Engine. Capacity: 12 gallons per minute. Pressure: 300 pounds. Tank capacity: 200 gallons.

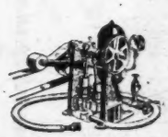
The "Victory Junior"
2 H. P. Novo engine. Capacity: 5 gallons per minute. Pressure: 250 pounds. Tank capacity: 150 gallons.

The "Wheel-A-Bout"
Fig. 874. Hand operated; 10 gallon tank, galvanized or brass as required. Rigid construction throughout.

The "Samson"
Fig. 933. 50 gallon tank with agitator. Will supply two leads of hose developing 150 pounds pressure.

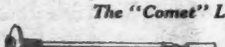
The "Century" Barrel Sprayer
Fig. 645. All internal working parts of brass—proof against corrosion. Capacity, at 30 strokes per minute, 2½ gallons.

The "Major" Barrel Sprayer
Fig. 832. Lower in price than the "Century" because of smaller capacity and different barrel attachment. Capacity, at 30 strokes per minute, 1½ gallons.



"Duplex" Plunger Pump
Fig. 761. For operation by *any* gasoline engine. Rugged construction. Unusual features of accessibility.

The "Comet" Long Distance Spray Gun



Can be used with any power outfit. All brass; weight only 2½ lbs. Interchangeable disco change capacities.

Complete information regarding the above and other Deming Spray Pumps will be gladly furnished upon request.

THE DEMING CO., 853 Depot St., Salem, O.
(Established 1880)

FREE CATALOG!

Send for complete Spray Catalog and Price Sheet. 10c to cover cost also brings 64 page guide "Spraying for Profit."

SANIKEEP

THE WRAPPER THAT REDUCED

APPLE SCALD

NASHUA GUMMED & COATED PAPER CO.

WAX PAPER MILLS

NASHUA, N. H. — MIDDLETOWN, OHIO

Note These Advantages of the Self-mixing Feature

1
You save half the cost of materials by mixing them yourself.

2
The dust is applied fresh from the mixer, when the ingredients are most active and effective.

3
You apply the dust at exactly the right time for best results. The materials for mixing are always readily available.

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You can mix material of the strength desired for the particular conditions

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You waste no time. When you are ready to dust, the materials are ready to use.

Better Dusting at *Less Cost*

If you intend to dust any part of your acreage you will get best results at least cost with a Bean Self-Mixing Power Duster. It will do everything that any duster can do and has this vital feature found on no other outfit—

The BEAN Mixes Its Own Dust

The process is simplicity itself. Just put the materials into the hopper, start the engine, and in a minute or two they are thoroly mixed and ready to apply.

Then open the feed regulator and the dust passes directly into the fan where, already finely divided, it is made still finer by the action of the fan and air, and is forced out at very high velocity in a fine all-enveloping cloud which insures complete coverage and best results. Feeder arm is quickly changed for dusts not requiring mixing.

Simple and Trouble-less

The Bean Duster has but one shaft and one belt, and is free from gears, chains, and complicated parts that get out of order and give trouble. Built in two types: 2-wheel for truck and vineyard work, 4-wheel for orchard work, both equipped with Bean 4 h.p. engine and both thoroly guaranteed.

Sign and send the coupon for full information

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BEAN SPRAY PUMP CO.
15 Hosmer St., Lansing, Mich.
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Please send me full information on Truck Duster—Orchard Duster—

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THE RECENT resignation of John F. Deegan as sales manager of the Federated Fruit and Vegetable Growers, Inc., was a surprise and disappointment to many persons who are interested in the progress of that organization. With all due respect to the many other good men on the staff, many persons believe that John Deegan was the strongest man in the organization, both in point of ability and in popularity among growers and co-operative leaders. Mr. Deegan has been a large factor in helping the Federated to achieve the success it has attained. Not only was he highly proficient in his work but he knew how to get along with his associates in the field; he knew how to attain and keep their faith and confidence; and he was an inspiration to his men through his very able letters and his personal contacts with them. Mr. Deegan was thus able to develop the finest kind of teamwork among his men, which is a matter of great importance to an organization like the Federated.

In addition to Mr. Deegan, a number of other good men have left the organization in the last few months, including Horton, Denny, Joe Deegan, Keenan, Albin, Sullivan, and Crawford. The Federated publicity has been indefinite as to the reasons for these withdrawals. In the case of Mr. Deegan, it was merely stated that his resignation had been accepted, which, of course, is susceptible of more than one interpretation. No statements have been given out regarding the other withdrawals so far as known to us. From other sources, however, it is learned that Mr. Deegan and some of the other men, at least, resigned voluntarily.

The loss of the services of these men is an important matter in the welfare of the Federated and to its grower members as well as to those who put in a lot of hard work in getting the Federated properly organized. A good round price was contracted by the Committee of Twenty-one for the good will of the North American Fruit Exchange, and the fact that the services of such men as Deegan and others were in prospect was an important factor in the transaction.

The loss of these men necessitates the training of new men to fill their places, which may mean more or less lowering of efficiency for a time at least, as well as increased costs of operation. It must be borne in mind that the men who have gone out will in some cases at least, enter concerns which are competing with the Federated, directly or indirectly. Since these men know so much about Federated affairs, they are in position to offer the most strenuous kind of opposition. Furthermore, since some of them, at least, apparently did not leave the organization in a friendly spirit, they can hardly be expected to help spread good will for the organization.

The question naturally arises as to what are the fundamental causes which brought about the withdrawal of these men. This is a matter which should receive the most careful consideration by the directors and executives and by the grower members of the different units.

A RECENT report shows that the membership of the Sun-Maid Raisin Growers of California is now 16,500. The report also states that it was possible only through co-operation to finance the 1924 crop; to expand the markets; to cut down the carry-over; and to make raisins a staple instead of a luxury. If it had not been for the association, it is claimed there would now be thousands of tons of raisins without a market, which on that account would be utterly worthless.

Attention is called to the fact that 247,000 tons of the world's production of nearly 500,000 tons in 1923 were produced in California and that the California grower "is battling with the raisin growers of Spain, South Africa, Australia, Afghanistan, Persia, Smyrna, Greece, and other countries, for his market." It is urged that every California raisin grower enlist with the Sun-Maid organization, as more extensive advertising campaigns and more intensive sales efforts are required to increase the market for the California product.

BECAUSE of the reports of damage from frost in California, the Florida Citrus Exchange has recently issued a statement to its members calling attention to the reports from California and suggesting that the circumstances should give Florida oranges a preference in the markets. The report suggests further that a very satisfactory season is expected in the marketing of Florida oranges still on the trees. Growers are warned against allowing speculators to buy their fruit at abnormally low prices in view of the circumstances.

"DEVELOPMENT and Present Status of Farmers' Co-operative Business Organizations" is the title of Department of Agriculture Bulletin No. 1302, just ready for distribution.

This publication contains statistical information collected during the past 11 years. There are 95 tables and 37 maps and charts. The statistical material has been compiled so as to show the number of associations of each kind in the various states in 1913, 1915 and 1924. Considerable data are given regarding the membership and the amount of business handled by the different kinds of organizations. Year of formation was reported by over 5000 associations, which information has been tabulated so as to show the periods of rapid expansion for the different kinds of organizations. Special tables have been compiled for the associations handling grain, livestock, butter, cotton, rice, tobacco and wool.

There are also included within the pages of the bulletin tables dealing with consumer co-operation and seven tables giving the available information regarding associations which have "gone out of business" and the reasons therefor.

Another feature of the publication is a set of 30 tables giving the available statistical and historical information regarding some of the larger or better known of the active associations.

As arranged, the bulletin is a "source-book" of agricultural co-operation in the United States. Copies may be had upon application to the Department of Agriculture, Washington, D. C.

"THERE must be a vast enlargement of voluntary organized effort among farmers themselves. It is indispensable that the farmers shall work together for their common interests and for national welfare. If they do not do this, no governmental activity, no legislation, not even better schools, will greatly avail."—*Report of Country Life Commission*, 1910.

Some Facts About Stationary Spray Plants

By W. P. Duruz and B. D. Moses
University of California

IT IS a proven fact that success in the fruit growing business is impossible without systematic and thorough spraying at critical times. Time of application is the essence of successful control when combating such orchard pests as codling moth, aphis, thrips, blister mites, scab, and brown rot.

On account of wet weather the ground is often so soft at the critical time for spraying as to make it impossible to move a power rig into the orchard, and the grower must wait until the ground dries sufficiently before he can get the spray on his trees. This delay often means the difference between profit and loss at the end of the season.

Conditions Which Influence Timely Spraying

Other conditions also often govern the possibility of timely spraying. Some of these may be enumerated as follows:

1. Heavy, wet soil.
2. Deep, sandy soil.
3. Low hanging branches, and props.
4. Insufficient drainage and sub-irrigation.
5. Hillside planting.
6. Intercrops.
7. Irrigation ditches, furrows, and checks.
8. Close planting.

The writers, realizing the growing interest in stationary spray plants, undertook a survey of those in use in California orchards. In this study there was found to be wide differences in the layouts, but the equipment was essentially the same. Each installation consisted of a central pumping plant with the mixing and service tanks, pumps, and power unit, which delivers the spray liquid under high pressure through mains and laterals to hydrants systematically arranged throughout the orchard. Hose, approximately 100 feet in length, makes it possible to spray some 40 trees from each hydrant.

Location of the Pumping Outfit

The location of the pumping plant is governed mainly by the size of the orchard, but water supply, accessibility, and topography are also determining factors. It is usually placed in some kind of a building as near the center of the orchard as possible.

Most of the plants at present are equipped with machinery taken from portable spray rigs adapted to the purpose by mounting on permanent bases, the gasoline engine being replaced by a motor, wherever electric power is available. In order to maintain a continuous supply of spray material, a supplementary tank is added, conveniently placed so as to facilitate mixing.

Mains and Laterals

In the larger orchards, the pump discharges through a header into several mains, each being controlled by its own valve. The mains serve laterals of smaller sized pipe spaced approximately seven tree rows apart, risers being placed at every seventh tree in the lateral line. Each lateral is controlled by its own valve, and each riser by a valve or service cock with a special hose connection. All piping is laid about 18 inches below the ground surface so as not to interfere with cultivation, and the risers are placed as near the trees as possible. The length of spray hose required depends upon the spacing of the risers and is usually 75 to 100 feet in length.

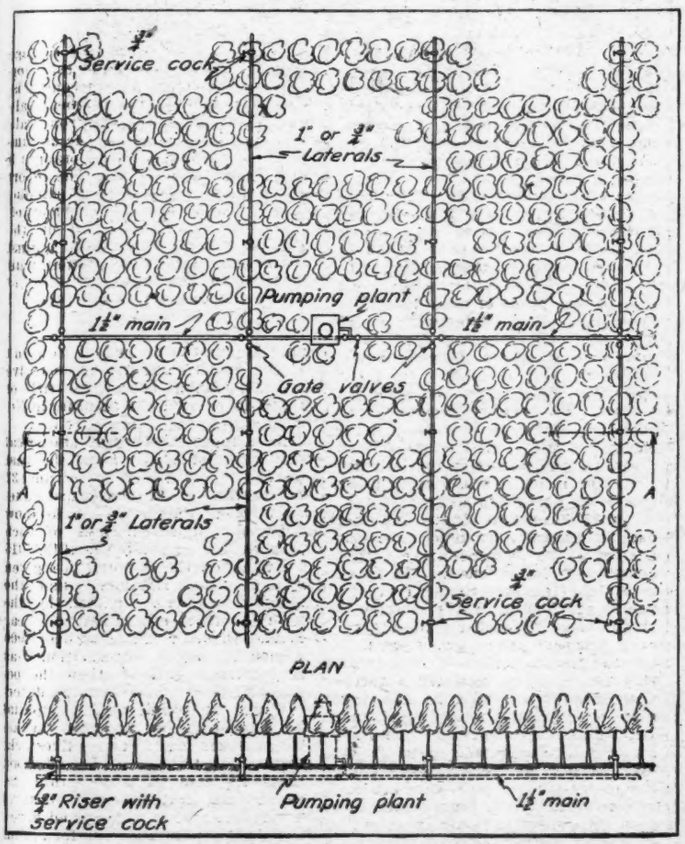


Diagram showing layout of stationary spraying plant

Practical Results

Readers no doubt will be interested in specific instances of quick, economic, and efficient spraying which

(*Continued on page 43*)

It pays to use

Niagara

DUSTS and DUSTERS

to protect your Fruit and Crops

Here are the plain facts that prove that the Niagara method is the most economical method and yet produces fruit of the highest market value.

Maine Department of Agriculture, Bulletin Vol. 17, No. 3

"The cost of material for dusting is about twice as great as for liquid spraying, but the cost of making an application of dust is much less than for one of spray. In general, the total cost per tree is about the same. Such a statement, however, does not take into consideration the fact that the time and labor saved by the dusting method usually can be applied to decided advantage to other farm operations, nor the equally important fact that the orchard may receive a complete treatment at a critical period."

Ordinarily the grower thinks of his material and his labor as the two factors that enter into the cost of protecting his fruit, either with the dusting or spraying method.

But when he sprays, he pays for gasoline and oil to run his sprayer five or six times as long as his duster—also to pump the water into the supply tank. He has interest on the investment, depreciation and repair on spray rig, spraying equipment and extra pumping gas engine, all of which is much less on a duster. He pays for the time wasted in going back and forth from supply tank to orchard. He pays for the time wasted in overhauling his spray rig in the Spring before he begins work and cleaning out the sprayer when he gets through work each day. He pays for the time lost for repairs during the spraying season, at which time every hour is of vital importance—all of which lost time is eliminated by dusting.

Read this again and think it over. Then remember that this dusting method gives the highest finish to apples, better color, smoother appearance.

N. Y. Experiment Station

From the standpoint of finish and lustre of the fruit, the apples dusted with sulphur were superior to those sprayed with lime-sulphur and were unexcelled by the fruit from any of the other treated plots. Jour. Econ. Ent. Vol. 17, No. 2.

Bert Johnson Orchards (4,000 acres of peach orchard), Nashville, Ark.

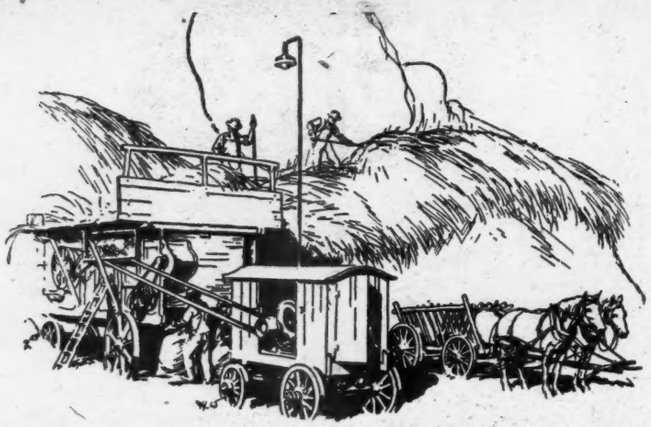
"Our experience with your dust for which we term our 'green sprays,' is everything that could be asked. The produce men give me credit for shipping the finest quality of peaches in any section of the country this year. We dusted with your dusters and materials. It was an ideal season for Brown Rot and fungus diseases, and we overcame these entirely with your dusting materials."

Every year for 9 years more growers have adopted the Niagara Method of Protection until today the demand for Niagara products requires the capacity output of the largest plant of its kind in the world.

Every grower will find it to his advantage to investigate the Niagara Method thoroughly and find out how to save money, time and crops by getting the right Niagara for his farm. Talk with your dealer or write us.

Niagara SPRAYER COMPANY
Middleport, New York

Hand — Traction — Power Dusters



Farm Electrification—
a challenge and a responsibility

The problem of electrifying the farm is a challenge both to scientific agriculture and to electric engineering. With agriculturists and engineers joining forces in solving this problem, the possibilities of farm electrification are limited only by man's ingenuity.

This splendid opportunity to serve the farm and benefit the entire country is not being overlooked either by the agriculturists or others interested. A committee composed of eight great organizations has been studying and carrying on experiments seeking solutions to these problems.

This general committee and local committees in twelve states have before them, among others, the problems of;

The lowering of farm production and marketing costs by the wholesale application of electric power.

The raising of the farmers' standards of living by the introduction of electrical conveniences.

The closer relation of the farmer to industry and transportation through the interconnection of electrical distribution systems and the wider use of electric power.

These studies and the solutions which are expected to result must have a profound effect upon every community.

Write for the attractive booklet on farm electrification which will be mailed to you without cost. Read it and pass it on to your neighbor.

The committee mentioned above is composed of the American Farm Bureau Federation, National Grange, American Society of Agricultural Engineers, U. S. Departments of Agriculture, Commerce and Interior, Farm Lighting Manufacturing Association and the National Electric Light Association.

NATIONAL ELECTRIC LIGHT ASSOCIATION

29 West 39th Street, New York, N. Y.

A VINEYARD is profitable only when it produces a good yield of sound, well bunched fruit, and such fruit is in better demand at higher prices than ever before.

There is increased and growing demand among grape growers for Nitrate of Soda as a result of the experience of those who have used it, which has proved that

IT PAYS TO USE
NITRATE OF SODA

200 pounds to the acre

It gives the vines a quick start and favorable growth for a fine set of fruit. Grapes are of good size and bunches well filled. The grapes ripen well and go to market in excellent condition.

If you want our bulletins or wish specific advice on the proper use of Nitrate of Soda or if you cannot readily secure the Nitrate you require write our nearest office. For our information please add the number 3625.

Chilean Nitrate of Soda—EDUCATIONAL BUREAU
Dr. William S. Myers, Director

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701 Cotton Exchange Bldg., Memphis, Tenn.
65 East State Street, Columbus, Ohio.
401 Hibernia Bank Bldg., New Orleans, La.
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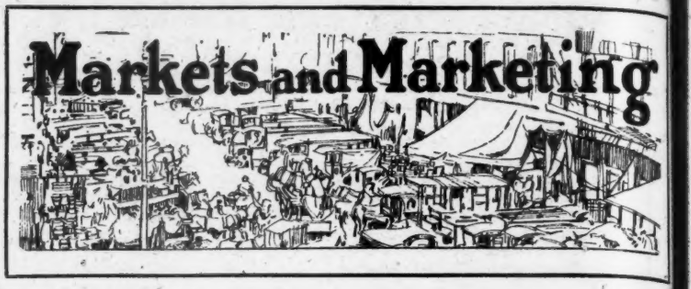


STANDARDIZATION of farm products has attained national and international importance within the past few years, furthered by increasing recognition of marketing problems. The national standardization program of the United States Department of Agriculture began in 1915, coincidentally with the establishing of the telegraphic market news service. Federal grades were formulated for Bermuda onions and for potatoes, use of the latter being made compulsory by the Food Administration.

Conditions during the war were so abnormal that little was accomplished. When the Food Administration closed in December, 1918, there was much speculation as to whether national grades could persist, but a second forward impulse had been given in 1917 by the establishment of the United States Food Products Inspection Service in principal receiving markets. A tremendous demand developed for additional standards, when, in co-operation with numerous state agencies, the inspection of perishables was extended to points of origin.

During the first year of its operation, the shipping-point inspection service issued certificates covering the quality and condition of 75,000 carloads of fruits and vegetables, and in the fiscal year 1923-24 the number increased to around 130,000 carloads. From 1915, when there were no recognized national grades for fruits and vegetables, the list of recommended grades reached 30 in 1924, and there was urgent demand for standards from growers of such products as artichokes, romaine, raspberries and rutabagas.

Potato grades are now officially sanctioned in 25 states and used as a basis for federal-state inspection at point of shipment in several others. Grades for one or more products have been adopted in 25 states and are used cooperatively in 34 states. It is estimated that at least 80 per cent of all potato shipments in the country are on the basis of federal grades.

In Virginia the past season, 500 apple growers organized standardization rings and collectively advertised their brands of fruit in connection with the United States apple grades. In Georgia, for the first time in the history of the state, the peach crop was packed on the basis of United States grades, with 8000 cars inspected and certified at shipping points. Foreign markets have begun to show preferences for officially inspected products. It is now universally recognized that the first principle of marketing is standardization.

Copies of any or all of the recommended grades can be had on application to the Fruit and Vegetable Division, Bureau of Agricultural Economics, Washington, D. C.—*Crops and Markets.*

PEACH growing in Utah is beginning to reach fairly large proportions. During the past season 1102 cars were shipped as compared with 1203 cars in 1923. The 1924 crop ripened about a week earlier than the 1923 crop because of hot, dry weather and a shortage of irrigation water. The crop was conspicuously clean, but the peaches averaged smaller in size than is normally the case.

The crop was shipped mostly in bushel baskets, packed so as to meet the Utah-United States No. 1 grade. Utah has adopted the federal grades for peaches except as to size requirements. A two-inch diameter is required as the minimum for No. 1 grade.

Prices in 1924 ranged from 90 cents to $1.35 per basket for the No. 1 grade, most sales being between $1 and $1.15. Carlot f. o. b. sales were made at $1 to $1.60. Many cars were sold at between $1.10 and $1.35 per bushel, and a large number were rolled unsold.

Shipments were made to 28 states in 1924. Cars were shipped to British Columbia, Florida, Michigan, Ohio and the Pacific Coast.

Box Elder and Utah counties are the heaviest peach producing counties. Weber, Salt Lake and Davis counties rank next in importance. The Elberta is the leading variety, although a few Crawfords, Carmens and Triumphs are grown for local markets. Practically all peaches are hand-picked and farm-packed. One association built a modern packing house and installed a power sizing machine the past season. The results are reported as satisfactory and other packing houses may be built to handle the next crop. It is said that growers were fairly well pleased with the results of the season.

COLD weather in southern California around Christmas time damaged oranges to a greater or less extent. While the damage is not regarded as great, it is believed that enough fruit has been injured to create an unfavorable impression and affect future sales if the defective fruits are shipped to market. Steps are therefore being taken to prevent the shipment of damaged fruit.

At a mass meeting of growers and shippers held in Los Angeles December 30, it was voted to enforce the county ordinances which prohibit shipments containing 15 per cent or more of fruit showing marked evidence of frost injury in two or more segments.

Following the request of the Southern Counties Horticultural Commissioners' League for a man to co-ordinate the frost inspection work, G. H. Hecke, Director of Agriculture, has assigned Stanley S. Rogers to this work. An assistant will be supplied later if needed.

"Until such time as drying out can be determined by an examination of the surface of a transverse section through the center of the fruit, samples will be taken in the same manner as in past frost seasons. Two transverse cuts will be made to remove the two ends of the fruit, leaving a section approximately one and one-half inches in thickness through the middle of the orange. This will then be broken so as to expose the outer walls of the segments. Fruit in which the four side walls of any two segments show crystalline deposits or waterlogging for the entire length of the wall, though not necessarily the entire area, will be considered as showing marked evidence of frost injury in two segments."

THE MONTHLY report of the Bureau of Agricultural Economics, United States Department of Agriculture, shows the following cold storage holdings of apples on January 1, 1925:

3,231,000 barrels, compared with 4,512,000 barrels on January 1, 1924, and a five-year average of 3,414,000 barrels.

9,220,000 boxes, compared with 14,201,000 boxes on January 1, 1924, and a five-year average of 9,870,000 boxes.

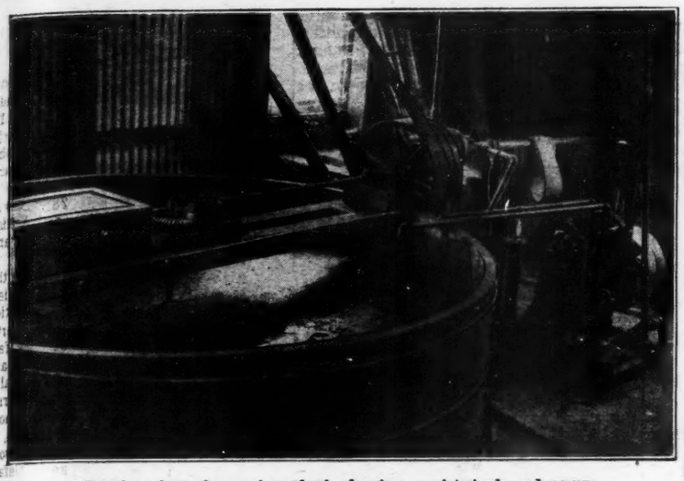
1,174,000 bushel baskets, compared with 1,351,000 bushel baskets on January 1, 1924.

Some Facts About Stationary Spray Plants

(*Continued from page* 41.)

has been accomplished through the use of this system.

One pear grower who has a plant eight years old stated that he has applied 10,400 gallons of spray in 10 hours with 10 leads of hose, or the equivalent of 10 average-sized bearing trees per man per hour. He satisfactorily sprayed his entire orchard of 30 acres in two and one-half days; this included the preparation, spraying and final flushing of the pipes.



Interior view of pumping plant, showing service tank and pump

Another grower operating a 215-acre bearing orchard made the statement that he was able to maintain a pressure of 290 pounds at the nozzle, operating 10 to 12 hoses simultaneously and applying approximately 800 gallons per hour.

A third orchardist said that his pump was capable of supplying spray to 17 crews of men and that it required only six days to spray his entire orchard of approximately 200 acres.

It is not within the scope of this article to go into detail of construction and cost. Suffice it to say that all owners are agreed that this system is economically sound. The initial cost, while high, is over-weighed by the decreased expense of operation, the saving in time and the increased efficiency.

Advantages and Disadvantages

The advantages and disadvantages of this method may be enumerated as follows:

Advantages.—

1. Spraying is not affected by soil conditions.
2. Pests that require quick action are speedily controlled.
3. Large orchards may be sprayed as effectively as small ones.
4. Convenience and saving in time and labor.
5. Long usefulness and low depreciation of equipment, a permanent improvement.
6. Spraying is possible with minimum danger of knocking or bruising the fruit on heavily ladened branches.
7. Props do not prevent spraying.
8. Hillside orchards may be more easily sprayed.
9. Intercropping is possible.
10. Possibility of using electric power.

Disadvantages.—

1. Initial cost.
2. All responsibility is on one plant.
3. Non-portability.
4. Possibility of spray material settling in pipes.
5. Upkeep and attention to numerous parts.
6. Possible damage to system during cultivation.
7. Possible loss by leakage.
8. Some spray material is wasted.
9. Slight loss in pressure due to friction.
10. Demand charge on electric motor.

Conclusions

It is only within the last 25 years that commercial spraying has been

(*Concluded on page* 56)

Spraying a cherry orchard by the underground system. Note man in the background attaching the hose

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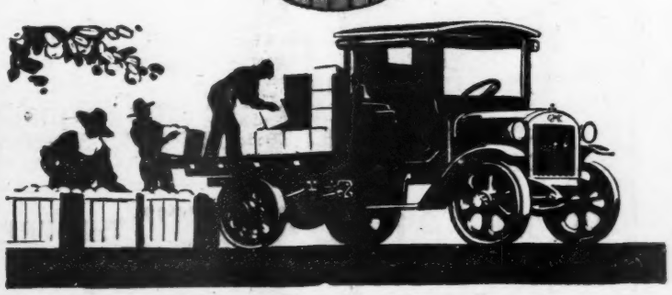

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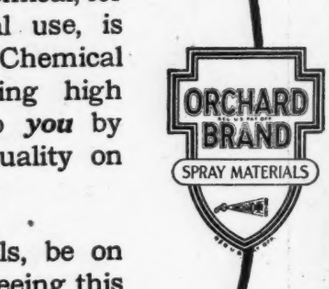

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Citrus Trunk and Root Disease Treatment

(*Continued from page* 5)

next in Portugal and Florida in 1865; in Australia in 1867; in Spain in 1871; and was first reported in California in 1875. It remained, however, for a member of the California Experiment Station, Dr. H. S. Fawcett, to discover the cause of this disease and to work out satisfactory control measures. Ten years of active investigation at his hands has brought out the important facts with reference to its cause and control both by prevention and by treatment.

Dr. Fawcett has shown the cause of this disease to be a soil inhabiting fungus of a very simple order, known as *Pythiacystis citrophthora*, the same organism which causes the brown rot decay of citrus fruits. This fungus apparently inhabits the soils in citrus producing districts the world over, and

This tree shows an old case of shell bark. The tools used in treatment are also shown

under favorable moisture conditions comes to the surface and attacks the bark of the trunk and roots. During heavy rains the spores are frequently splashed upon the low hanging fruit, resulting in the production of a characteristic soft decay, which in some years causes serious losses, especially on lemons.

The brown rot gum disease attacks all of the stocks commonly used for the propagation of citrus trees, with the exception of the sour orange, being especially severe on the lemon and sweet orange. It has the power of gaining entrance to the tree directly through the healthy bark of susceptible varieties, although materially assisted by the occurrence of wounds or injuries. The mechanical mixture of tissues occurring at the bud union appears to offer particularly favorable conditions for infection. The bark is rapidly invaded and killed, resulting in characteristic lesions, at the edges of which gum is exuded in considerable amounts. During the relatively short period of the year when conditions are favorable for the activity of the brown rot gum disease, it acts with great rapidity and may spread to points several feet above ground and on susceptible varieties down the roots for a considerable distance. The killing of the bark results in slow starvation of the tree, and, if unchecked by treatment, in two or three years the injury may become so severe as to reduce the tree to a non-profitable condition. While it is rare for trees to be killed outright, it is one of the commonest causes of failure to bear satisfactory crops.

As indicated above, control by preventive measures is by far the most satisfactory means of overcoming this disease. The use of the sour orange as a stock and the growing of nursery

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trees budded high and set out so that the bud unions are not less than six inches above the surface, will undoubtedly almost entirely eliminate it. Preventive measures adapted for use on trees not so propagated consist in keeping the soil pulled away from the bud unions where planted too deeply or where the soil has washed in, and in keeping the trunks and crown roots of such trees coated with Bordeaux whitewash.

The method of treatment developed for use on trees where the disease has become established consists in careful cutting out of the affected bark, making certain that an inch or so of healthy bark is also removed, followed by thorough disinfection of the wounds, usually with Bordeaux paste, as this compound serves admirably as a preventive to subsequent infections. The tools used should also be disinfected on account of the highly infectious character of the disease.

Botrytis or Gray Mold Gum Disease

Another type of gum disease affecting both the orange and lemon is that known as botrytis or gray mold gum disease. This trouble is much less prevalent, however, and Dr. Fawcett's studies have shown that it does not gain entrance through healthy bark. It most commonly occurs following injury to the outer layers of the bark occasioned by frost. This disease progresses much more slowly and works from the outer layers inward. Control measures consist in scraping off the outer layers of the bark and the application of disinfectants.

Scaly Bark of the Orange

Probably the most insidious gum disease of all is that known as scaly bark or psorosis. Especially during recent years this disease has become widespread, to the point where it can be found in nearly every orchard. In some orchards 90 per cent of the trees are badly affected by scaly bark. It progresses very slowly, however, and by the time there are visible indications of serious disturbance in the trees, it usually has been present for five years or more.

The exact cause of scaly bark is not yet known, although Dr. Fawcett has studied it exhaustively. Its infectious nature has been established, however, and in all probability it will eventually be shown to be the result of a specific organism. This disease is confined entirely to the orange and grapefruit and is usually most prevalent some distance above ground, frequently extending well up into the tree. Excepting in the last stages it does not kill the bark outright but merely works on the outer layers, producing a gradual but eventually serious condition of nutritional disturbance in which the trees gradually decline and eventually die.

Dr. Fawcett has shown that keeping the trunks and main branches of the trees coated with Bordeaux paste furnishes marked protection against the disease. Methods of treatment have been developed by him which are quite effective in the early stages, but in the later stages no completely satisfactory treatment is as yet available. In the early stages when the area of diseased bark is comparatively small, removal of diseased tissue in a manner similar to that used in the brown rot gum disease has proven very satisfactory. In the later stages a light scraping of the outer layers of the bark tissue has given the best results. This is done by means of special tools designed for this purpose, and in the hands of an experienced person the work can be done rapidly and cheaply. It has been shown that scraping alone will frequently result in complete cure, especially if the disease has not progressed too far. The application of disinfectants following scraping is recommended, however, principally for the purpose of preventing re-infection.

Lemon Shell Bark

A disease of minor importance which has come into prominence in recent years is that known as lemon shell bark or decorticosis. As indicated by the name, this disease affects only the lemon. Its characteristic effect is the production of longitudinal cracking and shelling off of the outer layers of the bark on the trunks of the trees. Although observed for years, it was not until recently that Dr. Fawcett established the fact that this disease is caused by a fungous organism, *Phomopsis Californica*. Shell bark is a rather peculiar disease in that it appears to be recurrent, and, providing the trees are reasonably vigorous, they apparently throw it off by shedding the outer layers of the bark. The new bark appears to be resistant for a time but is subsequently reinfected and the process repeated. At the present time treatment is recommended only for trees which have not previously been affected or where the disease appears to be recurring. The treatment used consists in a light scraping of the bark, followed by disinfection. The effect of this disease is also nutritional in character and the affected trees are frequently much improved by a fairly vigorous pruning.

Experience and observation have shown that the best results are secured when treatment is given in early spring. Rather painful experience has indicated, however, that the scraped bark of citrus trees is very susceptible to frost injury and to desiccation, for which reason treatment before danger of frosts in early spring is past, and treatment in late fall, are not recommended. The best results to date have been secured by treatment in April and May.

The principal disinfectant used in the past has been Bordeaux paste. The occurrence of a special form of fumigation injury on trees treated with this compound, however, has caused many growers to abandon its use in favor of other disinfectants which apparently do not induce this type of injury. Among these are dilute Bordeaux wash, weak potassium permanganate, five per cent carbolic acid in water, carbolineum and other materials.

Orchard Inspection

On account of the slow action of these diseases and the fact that serious injury is not apparent until they have progressed to the point where treatment is costly, and in some cases not always successful, the importance of an annual tree inspection is emphasized. For this reason, many California citrus growers are now keeping not only tree production records but tree health records as well. Each tree is given a careful inspection at least once a year, and on the basis of this inspection the proper control measures are applied. In this way the trees affected with trunk and root diseases are noted in the initial stages of the disease when control measures are simple and effective.

Destroy Mummied Fruit

HARD, shrivelled-up plums, apples and peaches, either on the ground or on the trees, may look harmless at this time of the year, but they are often the means of carrying spores of such destructive diseases as brown and black rot from season to season, according to the Pennsylvania Department of Agriculture.

Spraying may not control such diseases as brown rot of stone fruits and black rot of grapes unless these dried-up, diseased fruits are destroyed. The mummied fruits should be gathered up and either burned or buried at least one and one-half feet deep. Besides destroying the diseases mentioned, such treatment would also help to control several insect pests, such as codling moth, grape berry moth and Oriental fruit moth. If buried deep, the emergence of the adult fruit moths next spring will be prevented.

In the vicinity of orchards, the destruction of leaves and other dried material will break up hibernating quarters of the grape berry moth and the leaf hopper. Probably such treatment will also be of some value in the control of the Oriental fruit moth. The prompt removal and burning of dead and dying branches throughout the orchard is also important in the control of hibernating insects and destructive plant diseases.

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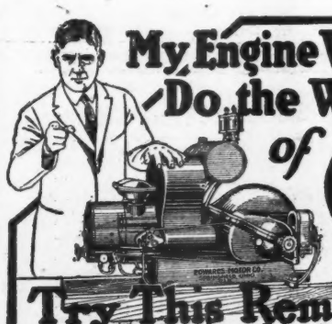

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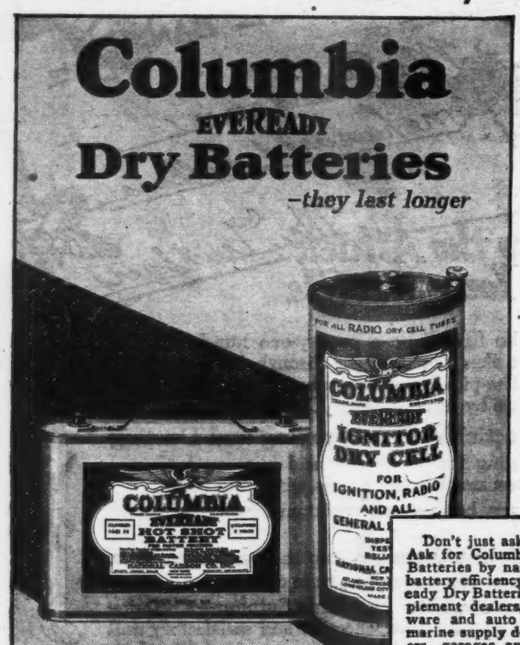

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Old and New Facts About Peach Leaf Curl

(*Continued from page 33*)

The credit for the discovery of a method of controlling curl, for the eastern states at least, belongs to Prof. L. R. Taft, then professor of horticulture at the Michigan Agricultural College. Like many other discoveries, it was a by-product of some tests carried out for another purpose, but the correct interpretation of the significance of his observations was made by this veteran worker.

The story of this discovery, as I have had it from Prof. Taft himself, is something like this: In the early days of spraying there were no such things as spraying programs or spray calendars; in fact, it was not known what the tree itself would stand in the way of spray mixtures. Bordeaux mixture was just beginning to be tested in the various newly formed experiment stations. Accordingly, in the spring of 1892, Prof. Taft set out to find what the peach tree would stand at various stages of growth, and he arranged tests wherein trees were sprayed at different times, the sprayings being at intervals of about four weeks, from April to July. Some trees received but one application; others were sprayed two, three and four times.

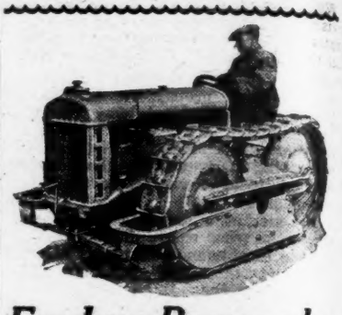
Findings Contrary to Accepted Belief

Note that in this test spraying for leaf curl was not thought of at all. All the text-books at that time looked upon the leaf curl disease as a necessary evil and one not subject to control by spraying. The students of plant diseases were well satisfied that the fungus was perpetuated by means of growing parts within the twigs far beyond the reach of any fungicide. But Prof. Taft's experiment demonstrated to him that all trees that received the spray of either Bordeaux mixture or plain copper sulphate *while the buds were dormant* were free from curl, while those sprayed after the leaf growth had appeared were severely injured by curl. The announcement was made at a meeting of growers held at the college, and the skepticism was great. Prof. Wheeler, well known as an authority on fungi, could not admit the possibility of control by such a spray—it was contrary to every statement in the text-books. The meeting adjourned to the orchard, and there inspection of the trees satisfied even the most skeptical. Surmise and uncertainty had to succumb to the evidence.

The following year further tests were made by Prof. Taft, which were successful in controlling leaf curl, and the results of these were published widely in the college bulletins. Then followed a wide series of demonstrations by the Department of Agriculture under the direction of N. B. Pierce, who had become interested in peach leaf curl through seeing the success of leaf curl control in California by means of dormant sprays. These demonstrations were carried on in every important peach growing district, and they substantiated the early announcements.

Other Investigations

The discovery of the method of controlling peach leaf curl, like many other great discoveries, came as the result of many independent observations, and the greatest good could come only when the information was made general and the method thoroughly tested. Growers in Australia found out as early as 1891 how to control curl under their conditions. Mention has been made of the early discoveries in California. But the various workers were unacquainted with the results of others. I think it was largely due to the early work of Prof. Taft and his work in succeeding years that the widespread tests in various states were undertaken. To N. B. Pierce, fruit growers owe the wide popularization of the method; his extensive demonstrations carried the good news to every fruit-growing center.



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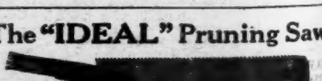
Chicks from winter laying, farm raised, mature stock White Wyandottes, White Rocks, Black Minorcas, S. C. W. Leghorns, R. I. Reds, Barred Rocks, White Orpingtons, Anconas, Black Jersey Giants, Indian Runner Ducks, $15 per 100 up. Pekin Ducks. Live delivery guaranteed. Parcel post prepaid. Hatching eggs, $8 and up per 100. Circular free.
GLEN ROCK NURSERY & STOCK FARM, Ridgewood, N. J.

The "IDEAL" Pruning Saw



"TRIMMING TIME"
Work from the ground with an 8-ft. handle saw. $3.00 delivered by parcels post at your door.
Manufactured by
A. H. PHILLIPS MFG. CO., HULBURTON, N. Y.

With this new knowledge came a revision of previous notions as to the wintering of the fungus. It meant that the life story of the parasite must be different from what had been supposed.

For a long time there has been a considerable gap in our knowledge of the parasite causing leaf curl. The fungus, aside from a sort of yeast-like budding, has resisted all attempts to grow it in pure culture so that study could be made of its life history. It appeared on the peach leaves in the spring, caused deformity of the leaves, clubbing of the twigs, a blotch here and there on the fruit, and it then disappeared from view, only to break out again and again whenever the spring was favorable to curl. Yet it seemed evident from the results of the spraying tests, where treatment of dormant buds prevented leaf curl, that the fungus must be harbored somewhere on the trees where the spray could reach it and it was believed that the fungus was perpetuated by spores lodged in the crevices of the bud scales. Note that this was mere surmise based on the spraying experiments.

Here the matter rested for 30 years after the early work. Recent work by Prof. A. J. Mix of the University of Kansas has reopened the problem. Prof. Mix at the 1923 meeting of the American Phytopathological Society announced his success in culturing the leaf curl fungus. From his results, it is seen that the leaf curl following spore production on leaves grows and produces more spores, thus furnishing in the orchard a myriad of spores which blow about and find lodgment on the bud scales of the buds which are forming on the new growth.

How Infection Is Brought About

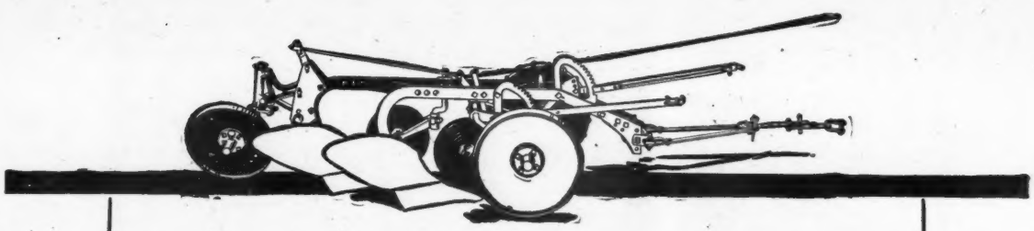
The story, then, of the development of peach leaf curl is now better known than ever before and it runs something like this: Due to the very profuse spore production of the leaf curl fungus, the developing buds of the peach have spores of the fungus lodged upon them soon after production of curled, distorted leaves takes place. Many growers do not know that the buds for the succeeding year's growth are produced in May and June, but such is the case. Here the fungus rests until the following spring, tests having shown that the fungus resists drying readily. With cold, wet seasons, the fungus is favored, and the peach is held back. As the buds swell and open, the fungus begins to grow and pushes in through the open scales, boring into the leaves of the peach that, tightly folded, are crowded together in the bud. The slower the growth of the shoot from the bud, the deeper and more extensive the penetration of the parasite. When the growth of the shoot starts, the leaves, into which the parasite has pierced, are pushed out. These are the leaves that show infection, and their pronounced swellings and distortions, along with their yellow and red color, make them conspicuous things in the orchard. The later formed leaves may be clean and free from curl. The degree of infection seems almost wholly dependent upon the infection at the bud period, since there is but little spread of the fungus from infected leaves to the later developed ones. This may be due to greater resistance of the leaves as well as to warmer, drier conditions. Every grower has noticed that the first leaves are the badly diseased ones, and these form a sort of tuft or rosette around the branch which in years of light attack soon appears to outgrow the major part of the infection.

The fungus fruits upon the curled and distorted leaves, covering them with a white, frosty coat, which sheds innumerable spores to perpetuate the fungus for another season. The curled leaves then drop to the ground, and in seasons of severe attack the trees may lose practically all of their foliage.

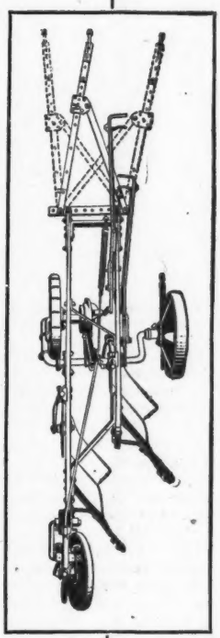
How to Control Peach Leaf Curl

In the case of peach leaf curl, we are dealing with a disease about which

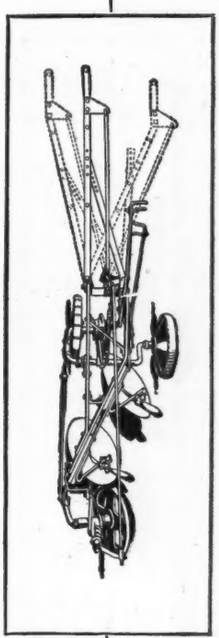
(*Concluded on page 53*)



Every Orchard Needs to be Plowed



Keeping orchards healthy by the proper use of a good plow is the time-proved method. Good plowing feeds the soil with cover crops, banishes mice and insects, kills weeds and conserves moisture.



Do the Job Right—With These John Deere Plows

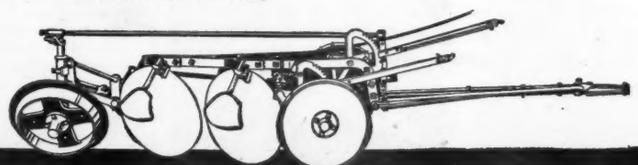
The John Deere No. 45-A, shown above, and No. 26, shown below, are built especially for use with small tractors in orchard plowing.

Only 26 inches high when plowing six inches deep and only 37 inches wide, they work under the low limbs up close to the row.

Hitch of each is widely adjustable for offsetting the plow. (Note this hitch feature, also narrow wheel base, in views at left and right.) Stiff hitch tends to hold plow steady when offset.

Both plows have unusual clearance for handling cover crops; simple, positive power lift, sturdy construction, and they pull unusually light.

See these plows at your John Deere dealer's store. Write today for free folder describing them. Address John Deere, Moline, Illinois. Ask for folder IH-21.



Works Under the Trees

THE "Acme" Grove and Orchard Harrows work right up under the branches. Sections can be closed together for field work. Then you have a tool unrivalled for making perfect seed beds in record time.

We have several new "Acme" models for tractor use, including a garden tractor attachment for truck farms. All are based on the Coulter principle—successful for half a century.

Maybe you have an old "Acme" which only needs a new set of Coulters to be as good as ever. If so write us.

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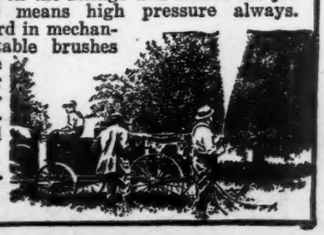
SPRAY with the OSPRAYMO High Pressure Machines

FORM a fine mist which stays on the foliage and makes the job effective. Using an OSPRAYMO means high pressure always. OSPRAYMO sprayers have the last word in mechanical agitators, with two stiff adjustable brushes working automatically in cleaning the suction strainers. No clogged pipes or nozzles. Our slogan: ***A Sprayer for Every Need — High Pressure Guaranteed.*** Write for catalog. Don't buy till it comes.



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With a reputation already earned for superior efficiency, economy, dependability and durability, Case tractors now step definitely into the lead for *power per dollar of cost.*

This triumph of Case engineering is established beyond question by recent official tests. With even greater fuel economy the Case tractor now gives you about 20 per cent more power for your money.

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BANNER
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R. R. RAIL SECTION T-STEEL
POSTS

The Selection of a Proper Spraying Outfit

(*Continued from page 4*)

laborious work necessary to operate the barrel and tank pumps efficiently; consequently, the grower may be forced to buy a power outfit which is larger than he needs.

Spray Nozzles Used.—No orchardist should make the mistake of attempting to decide what capacity of sprayer he will need without considering, also, the type of nozzle he expects to use. He should bear in mind that thoroughness of application, which is so essential for effective spraying, cannot be secured with the coarse, spattering spray delivered by a spray gun operated under low pressure. The convenience in handling and the high output of this type of nozzle has made it so popular among the fruit growers that it is very often used with outfits that do not have sufficient power to operate it properly. The minimum pressure required to operate the spray gun efficiently is 250 pounds, but 300 pounds is much more satisfactory. Experiments show that an outfit of at least three horse-power, delivering five and one-half gallons per minute, is necessary to develop this pressure day after day under average working conditions. An eight horse-power outfit may be expected to carry two guns, but a 10 horse-power engine will do so in a much more satisfactory manner without being overloaded.

Types of Sprayers

After having determined the capacity of the sprayer needed, the grower must then proceed to select from among the various types available the outfit which will best meet his requirements. Three types of sprayers are suitable for orchard work—the barrel pump, the tank pump, and the gasoline power outfit. An ordinary barrel pump can hardly be expected to deliver more than 50 to 70 gallons of spray mixture per hour. This would supply one standard size disk nozzle at about 100 to 125 pounds pressure.

The tank pump, often known as a double-acting pump, is the largest of the hand-operated sprayers. The best types of these have two cylinders and are also equipped with air chambers. A good type will discharge 80 to 100 gallons per hour at 125 to 150 pounds pressure, or possibly more if the right kind of labor is available. This capacity should be sufficient to operate two of the regular size disk nozzles in a very satisfactory manner.

Many different styles and designs of gasoline power sprayers are now on the market. While the range in capacity is very great, sprayers may be very readily grouped for consideration into three classes. The first class includes the 1½ to 3 horse-power machines, with a pump having a discharge rate of 3½ to 5½ gallons per minute. The second class embraces the 3 to 6 horse-power outfits, which will deliver 6 to 15 gallons per minute. The third class includes the still larger ones of 8 to 15 horse-power with three or four cylinder pumps and a discharge rate of 15 to 25 gallons per minute.

In addition, combination power outfits for spraying both orchards and truck crops are now on the market. These are usually two to four horse-power sprayers capable of delivering five to 10 gallons per minute. Still another form of equipment, usually known as the pipe line system, has been developed to meet special needs. Pressure is furnished in this case by a stationary pump of high capacity.

In considering the purchase of a power machine, the grower should remember that the capacity listed in the catalogue is always the maximum rate of which the outfit is capable under the most favorable conditions. In actual work in the orchard, this maximum rate is seldom or never obtained, and it is always advisable to figure on the actual performance being 15 to 30 per cent lower than the guaranteed rating. Similarly, the hand operated pumps are rated in the cata-

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Under Pressure in YOUR Home at the Turn of a Faucet!

The Hoosier Water Service operates from any source of supply — from well, creek, spring, lake or cistern, giving you that most advantageous convenience of the city—running water. Think what it means to have water under pressure for drinking, kitchen, bath, garden, lawns, garage, stock and for fire protection! Do away with the drudgery of pumping and carrying water for no more than the cost you are now paying. Uses any power—gasoline, electricity, or wind. Easy to install and operate. Protected inside and out by special GALVAZINK process. First cost is low and it gives long years of uninterrupted service. Sold by reliable merchants.

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PARKER'S HAIR BALSAM
REMOVES DANDRUFF
STOPS HAIR FALLING
Has been used with success for more than 40 years
RESTORES COLOR AND BEAUTY TO GRAY AND FADED HAIR
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Do your folks like spaghetti? Would you like to buy it *ready-cooked*—and more delicious than any spaghetti you ever tasted anywhere? Then get a few cans of *Beech-Nut* Prepared Spaghetti. It is no trouble to heat. You don't add a thing. It is not only cooked but *seasoned*. Beech-Nut Prepared Spaghetti is pure all the way through. Nutritious enough to make a meal of. Order with your groceries.

Already Cooked—Just Heat It

Beech-Nut *Prepared* Spaghetti

with delicious cheese and tomato sauce

As soon as you have read this issue of the American Fruit Grower Magazine, please pass it on to your neighbor.

logues on the number of strokes of the pump handle per minute.

From the study of the types of spraying machines, it is evident that the barrel pump would not be satisfactory for spraying more than a very few large trees, especially if they had to be covered within a few days. The best types of tank pumps would possibly be adequate for a home orchard of 100 to 200 trees, but could not be seriously considered in connection with a commercial orchard. On the other hand, either the barrel or tank pump is quite practical for use in spraying small trees. Usually, comparatively few sprays need be applied until trees are ready to bear; consequently the barrel pump may take care of 10 to 20 acres, and the tank pump of 20 to 50 acres in a very satisfactory manner, provided efficient labor can be obtained.

The gasoline power outfit is the only type that is practical for the commercial grower. For small orchards of possibly 10 to 20 acres, those outfits mentioned under the first class will be found adequate under average conditions. A combination sprayer might also be suitable for an orchard of this size. Probably most of the sprayers sold come within the second group. As they are very generally of sufficient capacity to operate one spray gun, or possibly one spray gun and one disk nozzle, they may perhaps be expected under average conditions to represent the proper economical equipment for about 20 to 30 acres. The still larger machines are required for more acreage, until their limit of efficiency is reached.

Based upon an average output of 1200 to 1600 gallons of spray per day, it might be stated that the average grower will ordinarily need an outfit of sufficient capacity to carry two spray guns for approximately each 40 acres of orchard. He should bear in mind, however, that these are merely suggestions, and that any general statement regarding the selection of proper and necessary spraying equipment must always be more or less modified to meet his individual requirements.

Originator of Dunlap Strawberry Passes

REVEREND J. R. REASONER, originator of the Senator Dunlap and Dr. Burrill strawberries, two of the best varieties in existence, died at his home in Urbana, Ill., on January 12, in his ninetieth year.

Reverend Reasoner was pastor of the Methodist Episcopal Church for many years. He was a lover of flowers, trees and plants in general, and in connection with his ministerial work, he grew and tested a considerable number of strawberry seedlings. In this way he developed the two varieties which have proved of such great value to both growers and consumers of this wonderful fruit.

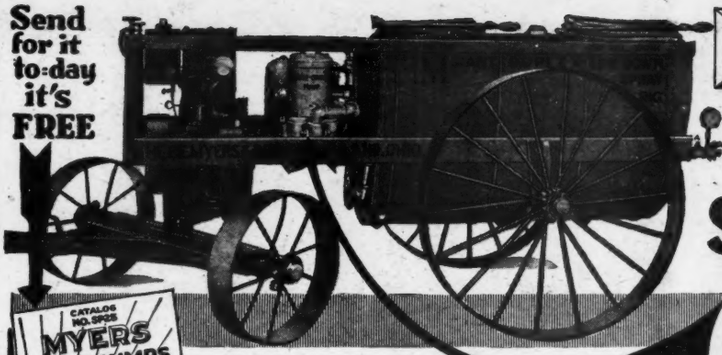
Reverend Reasoner always took a keen interest in horticulture. In days gone by his name appeared on the program of many horticultural societies, and he occupied offices in a number of organizations. Only a year ago the Illinois State Horticultural Society had Reverend Reasoner present as its honor guest at the annual banquet of the society.

Reverend Reasoner was also a collector of rare books, particularly those relating to horticulture. His collection of early horticultural literature is known widely in the United States, and to some extent in Europe.

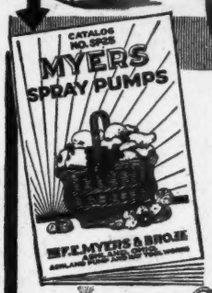
The death of Reverend Reasoner marks the passing of a notable figure in Illinois horticulture. Of him it can be said very appropriately that he left conditions better for his fellowmen than he found them.

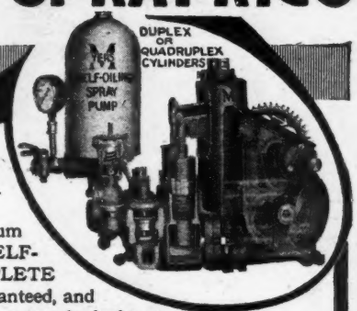
THE CALIFORNIA authorities have recently established a quarantine against the importation of Oregon black cherries because of diseases carried by them.

Send for it to-day it's FREE



MYERS SELF-OILING POWER SPRAY RIGS





High pressure, safely and uniformly maintained. Ample capacity, economical operation, minimum of wear and breakage.

The peak of power spraying perfection — the maximum in power spraying efficiency, are realities in MYERS SELF-OILING POWER SPRAY PUMPS and COMPLETE POWER SPRAY RIGS, now fully proven and guaranteed, and ready to demonstrate their superior qualities by a new standard of performance made possible through positive self-lubrication, enclosed working parts and other exclusive Myers features. There is a style and size for every power spraying requirement just as there is a Myers "Honor-Bilt" Bucket, Barrel or complete hand operated Outfit for service where spraying operations are not so extensive.

Your dealer will supply you with Myers Spray Pumps, Nozzles and Spraying Accessories. Insist on his doing so, or write us direct. Free, postage paid and without obligation to purchase—a copy of our new complete Spray Pump Catalog, No. SP25, just off the press, with thirty pages devoted to planting, fertilizing, pruning and spraying trees, plants and vegetables will be sent by return mail to anyone interested in spraying.

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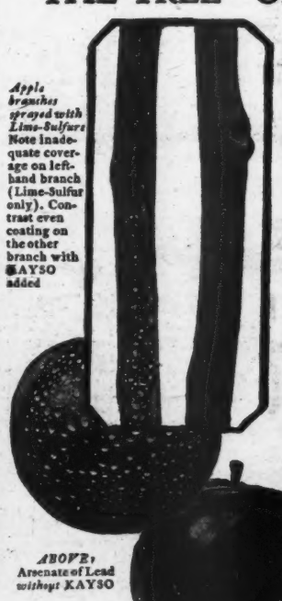
The next day it RAINED
AND WHERE WAS THE SPRAY? ON THE TREE—OR ON THE GROUND?



Apple branches sprayed with Lime-Sulfur Note inadequate coverage on left-hand branch (Lime-Sulfur only). Contrast even coating on the other branch with KAYSO added

"Let it rain!" says the man who has used KAYSO in his spray, because he knows that his spray will withstand the storm!

And why? Because KAYSO is an adhesive, as well as a spreader—"It Spreads the Spray and Makes It Stay!"

Entire spray coverage means more crop saved for you—more dollars at the end of the season.

KAYSO, as an emulsifier in the home-making of oil emulsion sprays, gives you a dependable spray at low cost.

It pays to be thorough! Ask your dealer for KAYSO—or write us for descriptive folder.

ABOVE: Arsenate of Lead *without* KAYSO

AT RIGHT: Same spray *with* KAYSO —note even coating

SPREADS the SPRAY and MAKES it STAY~

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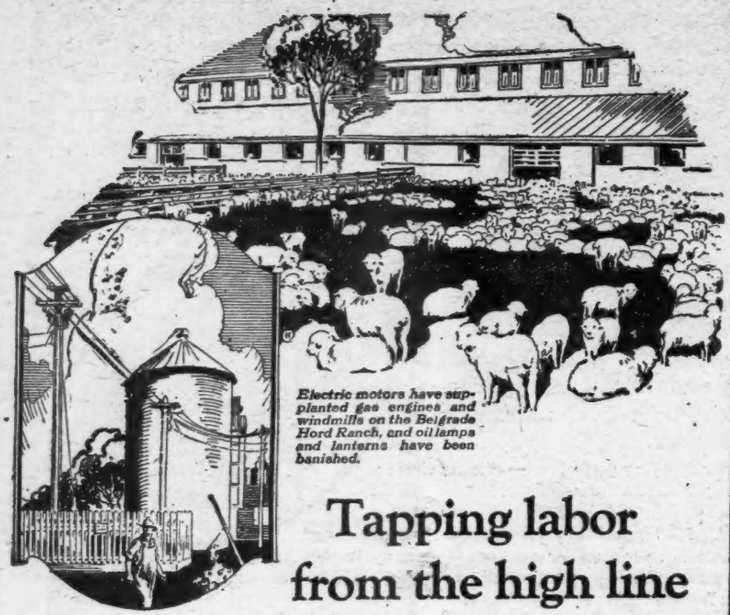

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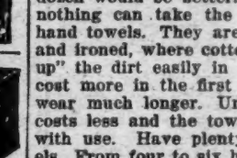

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CHATS WITH FRUIT GROWER'S WIFE

By HAZEL BURSELL

The Bride's Hope Chest

"WHAT should I have in my Hope Chest?" "How many of each kind?" "What type of things?"

These are a few of the questions that each prospective June bride must answer for herself very shortly if she wishes to have a Hope Chest full of just the right things when her wedding day dawns. February is none too early to begin planning and sewing. The hope chest things should all be ready a month, or better still, two months in advance. She will have the trousseau and wedding to plan for later.

She will, of course, have a supply of dainty lingerie, hosiery, boudoir caps, handkerchiefs, kimonos and combing jackets. These may be as numerous, as pretty and as varied as her clever fingers and ingenuity can make them. Do not forget to include some more serviceable house aprons and dresses, not to mention practical "dust" caps. These may still be pretty and interesting, though not "flimsy." Her wardrobe should be in keeping with her social needs, her community and her pocketbook.

Simplicity in Linens Best

Perhaps the next class to consider is household linens, including towels, bed linen, table linen, dresser scarfs. In making these things, the prospective bride should restrain her love of beauty somewhat and have simple, more substantial pieces, rather than elaborately decorated ones. It is all right to have a few nice guest towels, but farm women are few and far between who need all their hand towels embroidered, edged and monogramed. Hem the dish towels neatly, but they do not need blue tea pots embroidered in the corners. Of course, if the young bride is to live in the city after her marriage, then she would plan her hope chest accordingly.

No bride can have too many good substantial linen towels, or bath towels, or dish towels in her chest. Spend your money on fine materials rather than on decoration. Linen wears much longer than cotton, it washes and irons beautifully, and gets whiter and whiter with age. The bride will in all probability be given numerous guest towels at linen showers, and as wedding gifts.

No "chest" is really complete without six linen glass towels, for drying fine china and glassware. They leave no lint on glass. Five yards of linen glass toweling will make six tea towels, each 30 inches long. Flour sacks, bleached and hemmed, make satisfactory dish towels. The bride will need at least a dozen of these, and two dozen would be better. For the farm, nothing can take the place of linen hand towels. They are easily washed and ironed, where cotton never "gives up" the dirt easily in washing. They cost more in the first place, but will wear much longer. Unbleached linen costs less and the towels will whiten with use. Have plenty of hand towels. From four to six bath towels will be necessary. Buy big, thick, long ones.

Bed Linens Listed

The chest should contain at least three pair of sheets and three pair of pillow slips, and many more if possible. If I could have only three pair of each, they would be plain or nearly so, as they will see hard service. The pillow slips may have hemstitched hems, or possibly white monograms, or simple crocheted edges. If she has more bed linens, then she may be more lavish with her decorations on part of them.

Most mattresses are six feet and four inches long, so I would suggest that sheets be made seven feet and six inches long. This will allow for sufficient tucking in at the head and foot on the under sheet and turning back over the top of the blankets on the upper sheet. This is an important point, as few sheets are made long enough. If they cannot be properly tucked in, they wrinkle and become disarranged easily. Ready-made sheets are invariably a foot too wide and a foot too short. Buy a firm quality of bleached, double-width muslin, with little or no starch in the goods. Material with a rounded thread is the best.

Two bedspreads is the minimum number, and three would be better. Very handsome and practical ones can be made by working cross stitch or applique designs on unbleached muslin. A color-fast floss in the pastel shades should be used. The only disadvantage to the unbleached muslin is that it is hard to wash and iron, but the housewife may console herself with the fact that frequent washings will not be necessary.

Pretty Scarfs Can Be Made

The number, kind and size of dresser scarfs and buffet scarfs will be determined by each girl for herself. They too should be pretty, but not too easily worn out.

Cream marquisette may be made up with wide lace and insertion into attractive scarfs for dressing tables. Gay cretonne banded with rose sateen to match the bedspread is very pretty. Monograms and crocheted edges on white linen are always good looking. Cretonne doilies with hemstitched and crocheted edges in colors make unusual and inexpensive sets. Colored linens with simple designs in colors and fringed ends are popular. If unbleached muslin is used for the bedspread, scarfs to match can be made for the dressing table and chiffonier.

Pillows, comforters and nice woolen blankets properly belong in the bride's chest also. If she is lucky enough to have a lovely grandmother with a failing for quilt piecing, she may have a complete set without worry on her part. Two pair of pillows will be needed, as will at least two double blankets, and from four to six comforters. Each one will have to find her own needs and fill them.

Table damask is another problem which is often solved by gifts. She should have at least two linen damask tablecloths, the size to be determined by her table. The usual sizes are from two to two and one-half yards. It is nice to have a dozen dinner napkins to match one cloth, but six will do. Napkins may be purchased in strips so that hems are needed on only two sides. The bride who is to live on the farm will have little need for fancy luncheon sets—though they now have adorable ones to be done in colors.

Make Pretty Curtains

Most brides make and hang the curtains for their new home before the wedding, so that it will be homelike when they move into it. The type will depend on the house entirely. Checked gingham makes delightful curtains for the kitchen and breakfast nook. White dotted swiss is

ideal for the "tie-backs" so popular now. They have yards and yards of ruffles on them, but are most effective for bedrooms and even living rooms. Nothing could be lovelier than a fine dotted cream marquisette for living room curtains. Then the overdrapes may be of a richer plain or figured material which harmonizes with the furnishings.

The bride's accumulated treasures in silver, china, glassware, pictures, books, vases, pillows, candlesticks, pottery, book ends, etc., all will be welcome additions to the new home.

A rubber apron, laundry bag of gay cretonne, and clothes pin apron will also be found useful articles and will properly find a place in the complete bride's chest.

Salt as a Beautifier

SALT can be used as a beautifier literally from "top to toe." It is excellent for the hair and scalp, and, added to a hot foot bath, it brings comfort and relaxation to tired, aching feet. Although all who have tried it enjoy a cool, invigorating dip in the sea, not many appreciate the value of salt as an aid to beauty and enjoyment in the home.

A salt glow applied to the scalp will prevent falling hair, according to many beauty specialists. Make a solution of one-half pint warm water and one heaping teaspoonful of salt. Divide the hair into small strands and apply the salt water with a small sponge to your scalp along the partings. Massage briskly for five minutes. A massage with dry salt will also serve the same purpose. For the foot bath just throw a small handful of salt into a tub of tepid water.

A sweet breath and sound teeth are two prime requisites of beauty. Salt has sufficient antiseptic properties to make it ideal for the care of the mouth. Brush the teeth and gums with dry salt every other day and use your favorite dentrifice between times. One dental authority has a new suggestion for the care of the tooth brush. He says to buy several of them, then after using one, pack it away in a cup of dry salt for a day or so while you use the others.

Plain table salt may also be used in the bath. A handful may be thrown in the water, or the body may be given a light salt rub. If the latter method is used, the salt should be rinsed off well in tepid water. This process has a soothing effect on the tired body.

Children should be taught the value of salt. It is in youth that a healthy mouth is developed, and salt will help them to achieve this object.

Clean Kitchen Sink

IF YOUR kitchen sink becomes stopped up, you will often find that grease is the cause. Before using other measures, try to remove the grease. Place a few pieces of soda over the drain. Pour boiling hot water—be sure that it is boiling—down the sink over the soda. This will usually clear it.

Recipes Using Dates

WE HAVE given recipes for many fruits but so far we have neglected a most delicious and deservedly popular one—dates. In most recipes they can be used interchangeably with raisins for all kinds of cakes, cookies, puddings and salads. They give desserts a flavor and richness which no other fruit can impart. They are delicious eaten just as they are purchased or with nuts to top off the dinner.

Date Bread

1 c. warm wheat mush
¼ c. lukewarm water
¼ t. salt
¼ yeast cake
¼ c. brown sugar
2¼ c. flour
1 T. butter
⅔ c. walnuts
⅔ c. dates

Mix first four ingredients, add yeast cake dissolved in warm water, and flour; then knead. Cover and let rise over night. In the morning while kneading, add the chopped walnut meats and stoned, chopped dates. Shape in a loaf, let rise in pan until double in bulk, and bake 50 minutes in moderate oven. This bread is well adapted for sandwiches.

Date Pie

2 c. milk
2 eggs
½ lb. dates
¼ t. salt
Nutmeg

Cook dates with milk 20 minutes in top of double boiler. Strain and rub through sieve, then add eggs, salt and few gratings of nutmeg. Pour into a pie pan lined with rich crust and bake in moderate oven, slowly, as for custard pie.

Stuffed Date Salad

Remove stones from dates and fill cavities with cottage cheese, nut meats or cream cheese. Arrange on bed of lettuce with mound of apple and celery, nuts or cottage cheese in center. Add spoonful of dressing to center mound.

Quick Cake

½ c. soft butter
3 t. baking powder
1½ c. brown sugar
½ t. cinnamon
2 eggs
½ t. nutmeg
½ c. milk
½ lb. stoned dates, cut in pieces
1¾ c. flour

Put ingredients in bowl and beat all together for 3 minutes, using a wooden cake spoon. Bake in buttered and floured cake pan 35 to 40 minutes. If directions are followed, this makes a most satisfactory cake, but if ingredients are added separately it may not prove a success.

Graham Pudding

¼ c. butter
½ t. soda
½ c. molasses
1 t. salt
½ c. milk
1 c. dates, cut in pieces
1 egg
1½ c. graham flour

Melt butter, add molasses, milk, egg well beaten, dry ingredients, mixed and sifted, and raisins; turn into buttered mold, cover and steam 2½ hours. Serve with hard sauce.

Hard Sauce

⅓ c. butter
1 t. lemon extract
1 c. confectioners' sugar
1 t. vanilla

Cream butter, and add sugar gradually while beating constantly, then add flavoring. Serve on warm pudding.

Oatmeal Cookies

1½ c. sugar
1 t. cinnamon
1 c. shortening
1 t. ginger
2 c. rolled oats
2 c. flour
2 eggs
1 c. dates
½ c. sour milk
1 t. soda
1 t. salt

Cream shortening and sugar, add beaten egg, rolled oats, dates, salt, spices, soda dissolved in milk, and flour. Mix and drop from tip of spoon. Bake in moderate oven 10 to 12 minutes.

Steamed Date Pudding

1 c. molasses
½ t. salt
1 c. suet
½ lb. dates
1 c. milk
¼ t. allspice
3 c. flour
¼ t. cloves
1 t. soda
¼ t. mace
1½ t. cinnamon

Rub a little flour through the dates after grinding. Stir molasses, suet and milk together in bowl. Add flour and dry ingredients. Add fruit last. Steam 3 hours and serve with lemon cream or hard sauce.

Date Filled Cookies

1 c. brown sugar
1 c. flour
1 c. shortening
½ t. soda
2 c. oatmeal
½ c. cold water

Cream shortening and sugar, add liquid, flour and oatmeal. Roll out and cut as for ordinary cookies. Put 1 t. of the date filling between two cookies and bake in moderate oven. If sour cream is used as shortening, most of water should be left out.

Filling—One package of stoned dates and ½ c. sugar cooked with a little water until fruit is soft.

Ohio Pudding

1 c. sugar
1 c. grated raw carrot
1 c. flour
2 t. baking powder
1 c. chopped dates
1 t. salt
1 c. raisins
1 t. soda
1 c. grated raw potato

Mix and sift sugar, flour, baking powder, salt and soda. Add remaining ingredients, and mix thoroughly. Turn into buttered half-pound baking powder cans and steam two hours. Serve with Ohio sauce.

Ohio Sauce

½ c. butter
2 T. chopped nut meats
1 c. brown sugar
4 T. cream
2 T. chopped dates
½ t. lemon extract

Cream butter, add sugar gradually, while beating constantly, and add the cream, drop by drop. Then add remaining ingredients. Serve on individual portions of warm pudding.

Cream of Wheat With Dates

½ c. cream of wheat
¼ t. salt
1 c. dates
1½ c. boiling water

Chop and stone dates. Place boiling water in upper portion of double boiler and put directly over the heat. Add chopped dates and salt to water and when boiling rapidly, slowly stir into the water the cream of wheat. Cook over direct heat, stirring constantly; then place upper into lower portion of double boiler and cook 1 hour or more. Serve with cream.

Table of Equivalents

1 t. equals 1 teaspoonful.
1 T. equals 1 tablespoonful.
1 lb. equals 1 pound.
1 qt. equals 1 quart.
1 c. equals 1 cupful.

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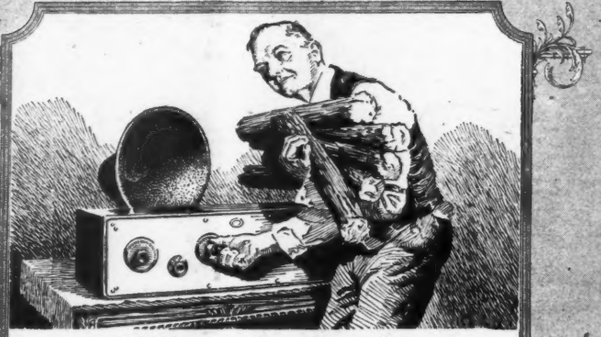

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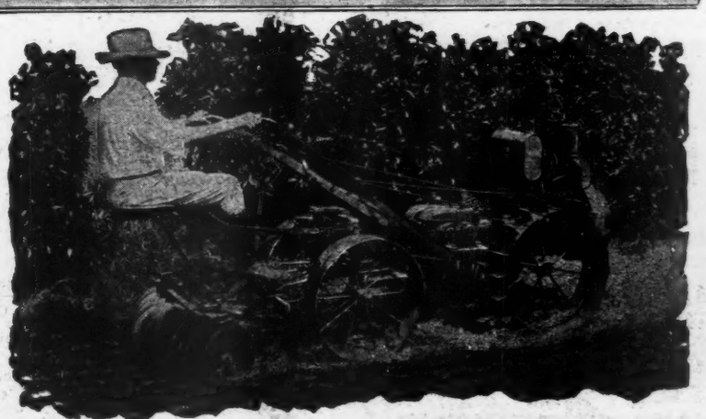

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Old and New Facts About Peach Leaf Curl

(*Continued from page 47*)

the salient facts are known and whose control is thoroughly worked out.

All authorities agree that to prevent leaf curl, *a disinfection of the dormant buds is necessary.* The experiments carried out by the various experiment stations have demonstrated that many spray mixtures will do this disinfection and that there is a wide leeway as to time of application. In most peach growing sections, the spraying to control leaf curl has become a standard practice.

Unfortunately, this valuable practice is widely neglected. The comparative freedom from curl in one season has served to make growers careless. Failure to control curl because of late application of the spray has in some places made growers doubt the value of the practice.

Spray Before Buds Begin to Swell

The consensus of opinion is that the spray application must be made before the buds begin to swell. The reason for this is obvious when we consider the behavior of the parasite. Prof. Taft's experience of over 35 years in the control of peach leaf curl leads him to recommend that the application be made at least two weeks before the swelling of the buds. I have always felt that he was working on the theory that if he recommended a safe period before the swelling of the buds, he could be assured that the bulk of growers would get the spraying done on time.

The Cornell station, recognizing that the spraying for curl in the spring comes at the busiest time of the year for the farmer, tried to meet the situation by demonstrating that fall spraying could be practiced. Under many conditions this is a satisfactory proposition, and as soon as the leaves fall, the dormant spray is put on. Some growers in Michigan greatly prefer the spring applications.

Materials to Use

But at all events, the spraying must precede the swelling of the buds. This means a very early application in some sections, and any failures in leaf curl control are usually directly traceable to delay in application. The job before the grower is the disinfection of the dormant buds. To accomplish this, a single application is sufficient, but the coating must be thoroughly applied. The materials which can be used are many. In the early experiments Bordeaux mixture, as well as plain copper sulphate solution, were used. These are successful. Cornell reports success with milk of lime. Lime-sulphur, 1 to 8 if scale is present, or one-half this strength (1 to 16 or even 1 to 20) if scale is not present, will control leaf curl.

Personally, for ease of preparation and cheapness, I believe that the lime-sulphur solution is the best material to use. The critical thing is not the chemical, it is the time of application. *The buds must be dormant.* Spraying to prevent curl as the leaves are expanding is of no value in preventing leaf curl and will burn the leaves severely.

Damage from Leaf Curl Large

The early investigations of Pierce placed the loss caused annually by peach leaf curl at $3,000,000. The records of the Plant Disease Survey tell a story of losses year after year which mount into the millions. Everyone who visits the peach districts from year to year has seen orchards stripped of their leaves in June and early July, with the crop dropping to the ground from malnutrition. A few years ago the largest peach growing district in Michigan suffered a 25 per cent loss of crop from curl, while last season the loss in these areas was 15 per cent. The records of other states are similar. The 1925 season is now before us. No peach grower can afford to take a chance with leaf curl now that scientific investigation and years of demonstration point out a safe way to insure the crop.

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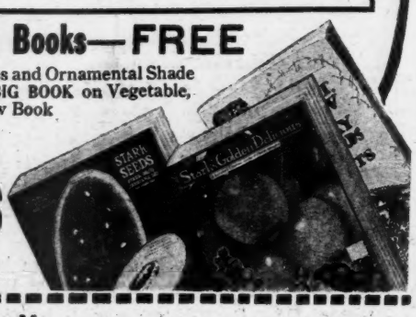

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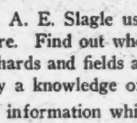

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(Continued from page 57.)

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STAMPS AND COINS.

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Edited by E. W. Lehmann

Overhauling and Repairing

PLANNING farm work so there will be no waste time is essential to securing a high labor income. This is the season of the year when the odd jobs should be done to avoid delays when time is a big factor, as far as the crop is concerned. Some of the things that are thought of as winter or rainy day jobs are: oiling the harness, cleaning out the barn and making repairs, making new gates or repairing old ones, overhauling the machinery, etc.

A Repair Week

Setting aside a week to devote to making machinery repairs is not a bad idea. This was advocated and carried out rather generally following the war. Such a plan might well be carried out by the individual fruit grower now. It certainly doesn't pay to neglect the machinery that is so essential to production. A sprayer in poor condition may prove to be worse than no sprayer at all, a machine will do effective work only when in first-class condition.

The following are six good business reasons why a definite repair week is worth while:

1. In order to practice thrift, a virtue in any business.
2. Most machinery is now idle, new parts may be secured, repairs can be made, and each machine can be put in first-class shape for instant use.
3. This is a slack season, other work is not so pressing.
4. Manufacturers, implement dealers, repair men, and blacksmiths can give better service now than during the rush season.
5. If a new machine is needed, a careful inspection of the old machine will make it known. An early order can be placed which will insure having the machine on time.
6. All surplus machines and equipment can be listed and sold. Many old machines are time wasters and the best place for them is in the junk man's yard.

Overhauling the Gas Engine

The gasoline engine is an important machine on every fruit farm. It may be a small decrepit hit-and-miss engine that is supplying water for the household and stock; or a high-speed six or eight cylinder; or a lowly flivver that makes it possible to reach town in a few minutes; or a heavy, or a high-speed truck for getting the fruit to market; or a tractor for disking the orchards; or it may be a motor for operating the sprayer. Whatever its duties are, it will need attention.

With all its tasks to perform, it can be seen that the gas motor plays a leading part on every fruit farm, and the fruit grower must be a better mechanic than formerly, and he should be able to overhaul his motors if necessary.

It is well to give every motor some attention before it reaches a point where it is ready to stop of its own accord; in fact, every gas engine should be given the "once over" at least once each year.

Know Your Machine

The first requirement in overhauling a gas engine is to know your machine, know all its working parts, and its characteristics. The tractor and gas engine owner or operator who does not feel the confidence needed to go ahead with repair work might well take advantage of the tractor short courses made available by the different state colleges and by the manufacturers.

The exact procedure of overhauling an engine will vary with the different makes. Nearly every manufacturer provides an instruction book that will be of great assistance in making all repairs and adjustments. If you do not have such a book, it will be well to get one.

The first step in overhauling a gas engine, whether it is the motor in a tractor, or a single cylinder stationary type, is to dismantle it and thoroughly clean all its parts. A bucket of kerosene and a brush is needed for this. Extreme care must always be observed in dismantling to avoid breakage. Secure new parts to take the place of those that are badly worn or broken.

The whole motor should be carefully gone over. Remove the cylinder head, clean out the carbon, and grind the valves. If the cylinders pump oil, or if there is loss of compression by the pistons, new piston rings should be put in. All bearings should be carefully cleaned and adjusted. Bearings should be tested for wear at regular intervals.

Cleanliness Is Important

Clean out the complete lubricating system and put in new oil and grease. It has been well said that "an oil can is a better tool for the amateur on the gas engine or tractor than a monkey wrench." In other words, be sure you know what you are doing before you begin to tinker with an expensive machine.

Remove all sticky or gummy grease from the governing mechanism, and see that it works freely and is properly adjusted. Don't overlook the cooling apparatus; see that the pump works and that there are no leaks. In reassembling, put in all new gaskets if there is any doubt about the old ones.

In addition to the mechanical side of a gas engine, the ignition and carburetion equipment may need attention. Avoid too much grease and oil on the magneto, see that it is clean; also renew wire leads if they are worn or oil soaked. If the magneto gives a weak spark, it may need the attention of a factory expert.

See that there is no sediment or water in the bottom of the fuel tank. Have the fuel line clean and inspect the carburetor. If the carburetor floods, it is possible the float is logged with gasoline. Remove it, dry it out, and then put on a coat of shellac. Dirt or particles of lint in the gasoline is liable to cause trouble.

Don't Neglect the Sprayer

While the gas engine is essential as the source of power for operating, the pump is really the heart of the sprayer. A spraying machine must supply sufficiently high pressure to do an effective job of spraying. This is true of the hand sprayers as well as the power sprayer. To maintain high pressure, the sprayer pump must be in first-class condition.

The main parts of every sprayer pump are the plunger, the cylinder, and the valves. These parts in the best sprayers are always made of noncorrosive material. The cylinder and plunger should be examined if the pump does not work satisfactorily. New plunger packing may be needed, or new valves, or valve seats. These may be easily removed and new ones put in place. The crank shaft and plunger rod bearings on power sprayers should be cleaned out and adjusted for wear. The springs and diaphragms of the automatic pump used on many sprayers may need renewing.

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Liquid Sprays vs. Dusts

By D. V. Rivenburgh

SOME interesting figures pertaining to the relative merits of liquid sprays and dusts were secured as the result of a questionnaire sent out by the Columbia County Farm Bureau, located in the Hudson River valley of New York. Replies were received from 56 growers, representing all of the important communities in the county. These growers control 1900 acres of orchard, varying from small to large plantings. The data was secured only from winter varieties. Table 1 shows the results obtained from liquid sprays, combinations of liquid sprays and dusts, and from dusts alone. Table 2 shows the number of applications made.

TABLE 1.—RESULTS FROM DIFFERENT SPRAY SCHEDULES.

	Spray.	Spray and Dust.	Dust.
Number of men reporting	42	11	3
Number of acres..	1120	622	180
Percentage of scab	7.42%	10%	21.6%
Percentage of "A" grade pack	75.5%	72.2%	61.6%
Percentage of culls	15.5%	7%	19.4%

Table 1 shows that in 1924 apple scab was better controlled with liquid sprays than with dusts. When both liquid sprays and dusts were used, the results seemed to be intermediate, though the percentage of culls seemed to be less with the combination schedules than when liquid sprays or dusts were used alone. The results appear to indicate that best results in controlling apple scab during 1924 in Columbia County were secured by means of liquid sprays or a combination of liquid sprays and dusts.

TABLE 2 — NUMBER OF APPLICATIONS OF EACH KIND OF MATERIAL.

Number of Applications.	Spray.	Spray and Dust.	Dust.
1	0	0	0
2	16	2	0
3	12	5	0
4	11	2	1
5	1	1	0
6	1	1	0
7	0	0	1
8	0	0	1

Table 2 shows that when liquid sprays only were used, there were less than three applications on the average; that with combination treatments there were more than three sprays; and that when dust alone was used, there were about six applications. These results indicate that the use of dust tended to increase the number of applications. Notwithstanding the larger number of applications made when dust was used, the dusts did not control scab as well as the liquid sprays or combinations of liquid sprays and dusts.

In considering these results, it must be borne in mind that apple scab was unusually severe in many of the northern states in 1924. On the average, it is not so severe as it was last year. Perhaps under average conditions the dust treatments will make a better showing in comparison with liquid sprays or combination treatments than was the case last year.

These results should not be taken as an indictment of dust treatments. No doubt the dusts have their proper place in our spraying programs. Under present conditions, the writer believes that growers should not turn to dusts entirely, but that they should, if dust is used at all, use it in connection with liquid sprays. Possibly in view of the marked improvements which are taking place in the development of dust materials and machinery for the application of dusts, the time will come when the use of dusts will be justified to a larger extent than is now the case.

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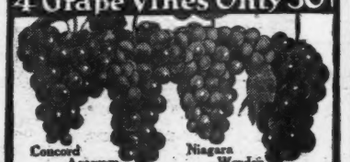

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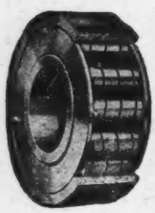

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Please send me the booklets "To Europe on United States Lines" and "Going Abroad."
If I go date will be about.....
There will be.....persons in my party.
Name.....
Address.....

Some Facts About Stationary Spray Plants

(*Continued from page 43*)

developed. In successive steps from the bucket pump to the gasoline power sprayer, there has been rapid advancement, and from the foregoing description it can be seen that there is still room for improvement. Is the stationary spray plant the next step? Some orchardists believe it is, and are now pioneering the way, and at least one large manufacturer has recognized the need and has placed on the market equipment for such a plant.

Risers should be placed as near the trees as possible

Each fruit grower should make a thorough study in light of his own conditions before making this capital investment. However, it is the opinion of the writers that just as the city water system has replaced the town pump, so the stationary spray plant will, to some extent, replace the portable spray rig.

A Handy Home-Made Dust Mixer

By C. L. Burkholder
Purdue University

MANY peach growers are now using a "Dry Mix" or "Home Mix" as a substitute for the old self-boiled lime sulphur. One of the most common and successful formulas is eight pounds of dusting sulphur, four pounds of finishing lime (hydrated lime), and eight ounces of a spreader, such as Kayso. These three materials must be thoroughly mixed before adding water or sifting into the spray tank. A simple device to do this work is in operation in the Barrett orchards at Henderson, Ky. A one-inch pipe was run through the center of an old lime-sulphur barrel and held in place by a washer and nut at each end. A crank was fastened on one end of the pipe and the barrel was mounted on wooden horses so that it could be easily revolved. A hole about eight inches square was cut in one side of the barrel and hinged fast.

Enough lime, sulphur and spreader can be dropped into the barrel for one or two tanks of spray. A few stones two to four inches in diameter are thrown into the barrel. By revolving the barrel at a slow speed the three materials are quickly and thoroughly mixed without the personal discomfiture which results when the materials are stirred with a paddle in an open barrel. When ready to unload, the contents of the barrel are dumped into a box over which coarse, heavy screen has been stretched to catch the stones. This same mixer is also used to prepare the gypsum-calcium-arsenate dust now commonly used for cucumber beetles.

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Florida's Most Attractive Resort
HOTEL ROYAL PALM
The Garden Spot of the West Coast
Open Dec. 15th
Ideal Climate.
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Paint Without Oil

Remarkable Discovery That Cuts Down the Cost of Paint Seventy-Five Per Cent.

A Free Trial Package Is Mailed to Everyone Who Writes.

A. L. Rice, a prominent manufacturer of Adams, N. Y., discovered a process of making a new kind of paint without the use of oil. He named it Powdr-paint. It comes in the form of a dry powder and all that is required is cold water to make a paint weather proof, fire proof, sanitary and durable for outside or inside painting. It is the cement principle applied to paint. It adheres to any surface, wood, stone or brick, spreads and looks like oil paint and costs about one-fourth as much.

Write to A. L. Rice, Inc., Manufacturers, 12 North St, Adams, N. Y., and a trial package will be mailed to you, also color card and full information showing you how you can save a good many dollars. Write today.

THIS HANDSOME VIOLIN GIVEN

Pleasing model, rosewood finish, highly polished, bow included, is our present to you for selling only 34 packets of Garden Spot Seeds. Quick easy sellers at 10 cts. Mammoth size, brightly colored packet. Send no money now. Write for seeds today. We trust you. When sold send $3.40 collected and Violin is yours, or choice from big catalogue sent with seeds. No extra money or postage to pay.
Lancaster County Seed Co., Station 38, PARADISE, PA.

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ATLANTIC CITY, N. J.
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American and European Plans
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RUSSIAN SPRINGFIELD SPORTING RIFLE
$10.45

5 shot using the U. S. Army caliber 30, Mod. 1906 cartridges. Weight, 8 pounds. Length, 42¾ inches; barrel, 22 inches. Turned down bolt handle. Special price, $10.45. Ball cartridges, hard nose, $3.50 per 100. Web cart. Belt, 40 cents. **15 Acres Army Goods Now Catalog 1923, 68th Anniversary Issue**, 972 pages, fully illustrated, contains pictures and historical information of all American military guns and pistols (including Colts) since 1776, with all World War rifles. Mailed 50c. Est'd 1865
Francis Bannerman Sons, 501 Broadway, New York City

DON'T WEAR A TRUSS

BE COMFORTABLE—
Wear the Brooks Appliance, the modern scientific invention which gives rupture sufferers immediate relief. It has no obnoxious springs or pads. Automatic Air Cushions bind and draw together the broken parts. No salves or plasters. Durable. Cheap. Sent on trial to prove its worth. Beware of imitations. Look for trade-mark bearing portrait and signature of C. E. Brooks which appears on every Appliance. None other genuine. Full information and booklet sent free in plain, sealed envelope.
BROOKS APPLIANCE CO., 213 A State St., Marshall, Mich.

$133 to $192 Month Become RAILWAY MAIL CLERK. Every second week off—full pay. Travel—see your country. Common education sufficient. Write IMMEDIATELY for free list of U. S. Government positions obtainable and free sample examination questions. U. S. Government positions open to women.
FRANKLIN INSTITUTE, DEPT. A 240, ROCHESTER, N.Y.

Classified Advertising

a word, set uniform style. Count each initial, abbreviation, number or group of numbers as one word. Write advertisement on separate sheet. Remittance must accompany order.

Forms close 15th of month.

FARMS AND ORCHARDS

CALIFORNIA STATE LAND BOARD HAS A number of desirable irrigated farms of twenty and forty acres in San Joaquin Valley for sale to actual bona fide farmers on 36½ years' time. Complete irrigation system. Price per acre varies according to location. Five per cent of purchase price payable when deal is made; remainder in semi-annual installments extending over period of 36½ years, with 5 per cent interest annually. Your opportunity to acquire a farm in winterless California. All deciduous fruits profitably grown; alfalfa is a paying crop. Ideal conditions for stock and poultry. Good schools and unsurpassed roads. Fruit associations market your crops, relieving you of marketing problems. You can farm all year in California. Splendid opportunities here for the man of moderate means. State Board's pamphlet, also Santa Fe illustrated folder describing San Joaquin Valley, mailed free on request. C. L. Seagraves, General Colonization Agent, Santa Fe Ry., 942 Railway Exchange, Chicago.

THE O. H. HARRISON ORCHARD, SOUTH-ern Park, Ky., just out of the city of Louisville on the L. & N. R. R. has to be sold to settle estate of O. H. Harrison, deceased. Over 12,000 bearing trees, mostly peaches. Various varieties, five to seven years old. Right exposure. Paces Preserved Highway. 275 acres. Write to Louisville Trust Co., Realtors, Louisville, Ky.

FOR SALE—100-ACRE ORCHARD JERSEY County, Ill. Excellent improvements, location, local marketing facilities, 85 acres bearing apples; all good varieties, first-class condition. Possession immediately. Price reasonable. Reason for sale, father deceased. Jane P. Shackelford, Greenville, Ill.

80 ACRES, ANNA, ILL. BIG BLDGS., WOVEN wire fences. Perfect fruit land. Sacrificed at $20 per A., one-third cash. Fisher, 7509 So. Broadway, St. Louis, Mo.

FREE LAND BOOK—"10,000 NATIONAL FARM Bargains." Write today, describing farm wanted. Farm Service Bureau, St. Louis, Mo.

WANTED—TO HEAR FROM OWNER OF FARM for sale for spring delivery. O. Hawley, Baldwin, Wis.

HELP WANTED—MALE.

$135 TO $192 MONTH. MEN-WOMEN, 18 UP. Get U. S. Government jobs. Steady work. Short hours. Life positions. Paid vacation. Pleasant work. Common education sufficient with our coaching. Experience unnecessary. List positions free. Write immediately. Franklin Institute, Dept. A-97, Rochester, N. Y.

EARN $110 TO $250 MONTHLY, EXPENSES paid as Railway Traffic Inspector. Position secured after completion of 3 months' home study course or money refunded. Excellent opportunities. Write for Free Booklet, G-100. Standard Business Training Inst., Buffalo, N. Y.

ALL MEN, WOMEN, BOYS, GIRLS, 17 TO 65, willing to accept Government Positions, $117-$250, traveling or stationary, write Mr. Ozment, 393 St. Louis, Mo., immediately.

EARN $25 WEEKLY, SPARE TIME, WRITING for newspapers, magazines. Experience unnecessary. Copyright book free. Press Syndicate, 979, St. Louis, Mo.

HELP WANTED—FEMALE.

GIRLS-WOMEN, 16 UP. LEARN GOWN MAKing at home. Earn $25.00 week. Dress better for less. Sample lessons free. Write immediately. Franklin Institute, Dept. A-547, Rochester, N. Y.

NURSERY

FOR SALE—THE WONDERFUL YOUNG DEW Berry, a Hybred of the Logan Berry and the Austin Dew Berry, a large pink berry turning to a dark wine when fully ripe. One of the finest yet produced for fruit juices, jellies, jams, etc. Should be in every garden and on every farm for home use and for commercial purposes. $1.50 per doz., $7.50 per 100. Supply limited. Citronelle Nursery & Orchard Co., Citronelle, Ala.

UNITED STATES RECORD, $2,059.20—1 ACRE Champion Everbearing Strawberries in 129 days, 202 crates. Averaged $125.00 per 1,000 plants set same year. Bears 5 months. Plants less than cent each, direct from originator. Also other varieties. Fruit trees, shrubs, Giant melon and sweetcorn seed. Illustrated catalog free. Edward Lobke, New Buffalo, Michigan.

FRUIT TREES, GREATLY REDUCED PRICES, direct to planters in small or large lots by express, freight or parcel post. Free 68-page catalog. Peaches, apples, plums, pears, cherries, grapes, nuts, berries, pecans, vines. Ornamental trees, vines and shrubs. Tennessee Nursery Co., Box 101, Cleveland, Tenn.

OUR BEST GARDEN BUY IN PLANTS—COlumbian, productive, delicious raspberry; Bliss, highest quality strawberry; Washington, healthful asparagus. Twenty plants of each kind postpaid for only two dollars. Interesting circular free. Certified Plant Farm, Macedon, N. Y.

APPLE TREES, PEACH, PEAR, PLUM, CHERry, small fruits, roses and shrubs, grapevines by the thousand. We save you 30 to 40 per cent on every order. Write for wholesale list. "Truth Well Told." Welch Nursery, Shenandoah, Iowa.

AWAKE. LOOK TO YOUR OWN INTEREST. Plant Brodbeck Medium sweet cherry trees. Far larger and better than others. Only two failures in thirty years. S. S. Brodbeck, Gallatin, Mo.

FRUIT TREES, SMALL FRUIT, GROWING Christmas trees, ornamental evergreens. Let me tell what I can do for you. My motto: "The customer is always right." Borling, Madison, O.

MILLIONS STRAWBERRY PLANTS, $2.95 PER 1000. Raspberries, grapes, bulbs, flower seeds. Catalog free. Illustrated catalog free. Mayer's Plant Nursery, Box 52, Merrill, Mich.

STRAWBERRY, CUMBERLAND BLACK RASPberry, Eldorado Blackberry plants for sale from bearing plantations. J. A. Combs, Rural Route 2, Collinsville, Ill.

READ OUR DISPLAY ADVERTISEMENT ON another page. No better plants anywhere. Catalog free. Strawberry, $2.75, 1000. O. Kiger Nursery, Dryer, Mich.

APPLE GRAFTS AND SEEDLINGS. GROW your own apple trees. Write for list of varieties and prices. Whitford Nursery, Farina, Ill.

STRAWBERRY PLANTS, CATALOG FREE. Jeff Beaver & Sons, Eau Claire, Wis.

EDUCATIONAL

RAILROAD POSTAL CLERKS, START $133 month, railroad pass. Send stamp for instructions. Columbus Institute, V-53, Columbus, Ohio.

TOBACCO.

TOBACCO—THREE-YEAR-OLD LEAF, 8 LBS. Chewing, $2.00; 8 smoking, $2.20; 8 Second smoking, $1.40. Pay for tobacco and postage when received. Old Homespun Co., Hawesville, Ky.

HOMESPUN TOBACCO, CHEWING, FIVE pounds, $1.50; ten, $2.50. Smoking, five pounds, $1.25; ten, $2.00. Pipe free. Money back if not satisfied. United Tobacco Growers, Paducah, Ky.

BERRY BOXES.

BERRY BOXES IN THE FLAT, MAKE THEM up now and save time in the spring. Write for catalog. The Central Basket Co., Berrien Springs, Mich.

FOR SALE—EXCHANGE

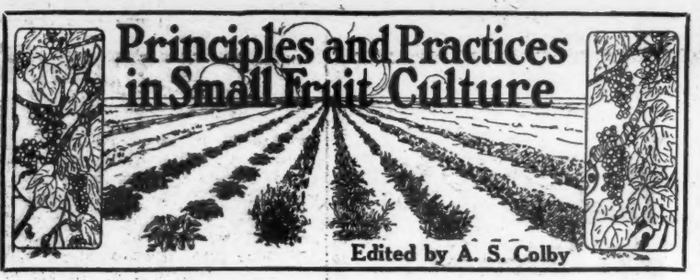
HARDWOOD ASHES IMPROVE ORCHARDS, lawns, flower gardens, pastures, meadows, wheat, corn, oats. Free circular. Agents wanted. George Stevens Peterborough, Ontario.

CHICKS

DAY OLD CHICKS FOR SALE — STRONG hatched, healthy chicks. Thousands per week at low prices. Circular free. Old Honesty Hatchery, Dept. G, New Washington, O.

BABY CHICKS—11C UP. ROCKS, LEGHORNS, Reds, Orpingtons. Catalogue free. Goshen Poultry Farms, Goshen, Indiana.

(For other classified advertisements, see page 54.)



Small Fruit Disease Control

AS A GENERAL rule diseases constitute one of the most important factors in the culture of small fruits. Spraying with the right materials at the right time and in the right way is the most important single method of controlling diseases. Other methods include: insistence on the grower's part that he receive from the nurseryman true-to-name, disease-free stock only; the planting of kinds and varieties not subject to winter injury and other climatic conditions; the selection of more disease-resistant varieties; good culture; and other sanitary measures in the care and harvesting of the crop.

Buy Clean Stock, True-to-Name

Through co-operation of state and federal authorities, well directed operations are under way to eliminate as far as possible the serious systemic raspberry troubles in nursery plantings, such as leaf curl, mosaic, and bramble streak. This can be done more certainly with the Latham red raspberry, originated and first propagated in Minnesota. It is hoped that through rigorous roguing out of infected plants by the nurserymen who are co-operating with proper authorities, it will soon be possible to obtain clean stock of this most excellent raspberry variety. In the meantime, growers should be very careful in buying raspberry stock from unknown sources. They cannot afford to infect their plantations with any more diseases which are difficult to recognize and are dangerous in character. No amount of good culture will make a diseased plantation profitable throughout the period of years to be expected under normal conditions.

Certain Diseases Are Controlled by Spraying

Certain diseases, including raspberry anthracnose; currant, gooseberry, and strawberry leaf spots; grape black rot and mildew, can be controlled by the application of fungicidal sprays, coupled with sanitation in the plantation. A comprehensive spray schedule should first be worked out, based upon a knowledge of the life histories of the diseases attacking small fruits. The grower should then follow out this schedule rather closely, varying it somewhat from one season to another as climatic and other environmental conditions make it necessary.

It is important that spraying should be done thoroughly and carefully. The peculiar bark of the black raspberry is difficult to cover properly unless special pains are taken in spraying. The addition of some casein preparation to the lime sulphur spray for anthracnose is helpful in controlling that disease. This is probably due to the better adhesion of lime sulphur where the sticker is used. In spraying grapes, the underside of the foliage must be covered. This can best be done by a careful workman using an angle nozzle on the end of a short spray rod.

Diseases Not Controlled by Spraying

Some other diseases, including crown gall and the mosaic troubles on raspberries, apparently cannot be controlled by spraying. Starting with clean plants, planting should be done only on new land, and the best of care should be given the plantation as far as sanitation is concerned. Infected plants should be watched for, especially in early summer, removed from the patch, and burned as soon as found. Sanitary measures which should be used include the following: Cut off the old stem or "handle" of the young black raspberry tip when planting. This tip often harbors raspberry anthracnose. Trim out and burn at once the dead canes as soon as possible after the crop is off in the raspberry and blackberry patch. Burn over the strawberry plantation after the fruiting season.

Take the utmost care to keep down weeds in the small fruit plantation. Weeds deprive the small fruit plants of the nutrients they require for a healthy and productive growth, they harbor diseases and create a condition favorable to fungous growth through providing a surplus of shade and moisture about plants.

A beginning has been made in the finding and propagation of varieties more resistant to diseases than some of the older sorts. Raspberries less subject to anthracnose, strawberries and gooseberries more resistant to leaf spot, and grapes less susceptible to black rot are being grown. These are of commercial value from the standpoint of yield and quality of the fruit produced. This field is a promising one, and we are much interested in its further development.

Good culture with reference to methods of soil management has a direct bearing on the health and vigor of the plants in the small fruit plantation. Principles involving the control of necessary soil moisture should be known and practices followed based upon such knowledge. It is quite certain, for example, that there is a direct connection between so-called winter injury and the presence of sufficient moisture in the plantation the previous summer. Raspberries weakened by lack of necessary moisture during the summer and fall months often succumb to crown gall, for example, the next year. Mulching with strawy manure is of considerable benefit, even in plantations slightly infected with crown gall, in helping plants to overcome the devitalizing effects of the disease.

The small fruit grower of the future will use all these and other methods of disease control in making a success in his work.

A tobacco that never changes, deposes Mr. Bruce

And you'll say he ought to be a judge

Mr. Bruce doesn't know of the eternal vigilance that its makers exercise to keep "good old Edgeworth" unchanged in quality. But it is our conviction that a man buys the next tin of Edgeworth because he liked the one before it.

Therefore, it is up to us to see that he gets what he is trying to buy—"more of the same." We are glad to know that Edgeworth smokers realize the uniformity that we rather painstakingly maintain for them.

And Mr. Bruce is well qualified to testify on this point. He tells us that he averages better than half a tin a day, and he has been smoking Edgeworth for eight years.

Let's see—that's something like 1461 tins for Mr. Bruce, according to our office calculator. But Mr. Bruce's own letter will be more interesting than our comments: Here it is:

Savannah, Ga.
March 14, 1924.

Messrs. Larus and Bro. Co.,
Richmond, Va.

Gentlemen:

I have been using Edgeworth since 1916 and think it is the best pipe tobacco on the market. The flavor and aroma are distinctive; the quality being the very best, never changes; and as I have smoked nearly every brand of pipe tobacco made, I have never found its equal.

My pipe is in my mouth nearly every hour of the day, and I smoke continually, using a can in less than two days, but have never felt any bad effects from Edgeworth.

I have the best smoking combination there is—a can of Edgeworth and a B. B. E. curve stem—and these two friends, having been with me for eight years, are going to be with me as long as I live.

Wishing you and Edgeworth the best of success, I remain,
Yours very truly,
(signed) F. K. Bruce,
705 East 39th St.

Let us send you free samples of Edgeworth so that you may put it to the pipe test. If you like the samples, you'll like Edgeworth wherever and whenever you buy it, for it never changes in quality.

Send your name and address to Larus & Brother Company, 13B South 21st Street, Richmond, Va.

Edgeworth is sold in various sizes to suit the needs and means of all purchasers. Both Edgeworth Plug Slice and Ready-Rubbed are packed in small, pocket-size packages, in handsome humidors holding a pound, and also in several handy in-between sizes.

We'll be grateful for the name and address of your tobacco dealer, too, if you care to add them.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth, Larus & Brother Company will gladly send you prepaid by parcel post a one- or two-dozen carton of any size of Edgeworth Plug Slice or Ready-Rubbed for the same price you would pay the jobber.

Aphis-stung apples

Don't let this happen to *your* apples

Kill the aphids before they have a chance to do serious damage to fruit or trees. Spray with Hall's Nicotine Sulphate. It contains 40% pure Nicotine—the deadliest aphis-poison known.

Being a vegetable extract, it does not harm blossom, fruit or foliage; but it does kill aphids every time.

A ten-pound tin makes 800 to 1100 gallons of spray. The cost is less than *2c a gallon.*

When spraying for scab, codling moth, etc., mix Hall's Nicotine Sulphate with the solution and make one spray do double duty.

Buy from your dealer. If he cannot supply you, send us your order along with his name.

Note—Hall's Nicotine Sulphate is also deadly effective against thrips, red bugs, leaf hoppers, psylla and many similar insects on fruit trees and truck crops.

10 lb. tins, $13.50
2 lb. tins, 3.50
½ lb. tins, 1.25
1 oz. bottles, .35

HALL'S
NICOTINE SULPHATE

Hall Tobacco Chemical Co.
212 Fifth Avenue, New York City

A Sign of Better Crops

Wherever you see this orange and black sign on a dealer's store or warehouse, there you will know is Headquarters for Spray Products; because the dealer who announces that he is satisfied with no lesser quality than GRASSELLI GRADE is a dealer who puts *your* interests first, by offering you crop certainty.

Play safe—rely upon the 86 years' experience and reputation of GRASSELLI. This name on Spray Products means acknowledged leadership in quality and unvarying uniformity, and costs you no more than some unknown name.

Arsenate of Lead
Calcium Arsenate
Lime Sulphur
Bordeaux Mixture
Casein Spreader

THE GRASSELLI CHEMICAL CO., CLEVELAND
Founded in 1839

New York, Boston, Philadelphia, Albany, New Haven, Detroit, Chicago, Milwaukee, St. Paul, New Orleans, Birmingham, Cincinnati, St. Louis

GRASSELLI GRADE
A Standard Held High for 86 Years

Bee Keeping for Fruit Growers

Edited by H. F. Wilson

Co-operative Beekeeping

NEARLY every farm industry is today suffering from the lack of co-operation among producers of farm products. This situation has resulted in the attempt by the government to provide methods of relief for the American farmers. Lack of business methods and co-operation among the farmers themselves has brought this situation about. The beekeeping industry is in the same condition throughout the entire United States, and, unless we can get together on a co-operative advertising and selling campaign, it will be impossible to achieve any great progress.

The American Honey Producers' League, the only national association of beekeepers in America, has, during the past year, attempted to develop for the beekeepers a plan of "Maximum Advertising at Minimum Cost," which consists of providing standard containers, standard labels, standard posters, a standard trade-mark and standard grades.

With this beginning, the First National Honey Week to be held in America was set for the week of November 16-22, some 25 states co-operating in this effort, and, while the beginning was quite small, it showed quite plainly that a great deal could be accomplished in this way.

A Second National Honey Week will probably be held the week previous to Thanksgiving, November 15-21, 1925, at which time a national advertising campaign will be put on in every state. It is hoped that each individual beekeeper will participate in this event. Information about the campaign can be secured from Dr. S. B. Fracker, national secretary of the League, Madison, Wis.

Bees Will Need Special Attention This Spring

ABOUT this time of the year the beekeeper begins to worry about his bees and the condition they will be in when he is ready to set them out in the spring. Just what effect the cold weather had on bees is yet too early to tell, but we may expect that the losses will be severe, both because of a lack of proper winter protection and a lack of suitable winter stores. This will be especially true in regions where the bees were not covered with a blanket of snow before the cold came on.

You should be ready, therefore, to examine your bees as early as possible this spring to determine whether or not the bees are alive and if they have sufficient food to carry them until nectar is available in the field. If you have had the foresight to save combs of honey, at least one of these should be slipped in each hive as soon as it is possible to work with the bees. If you have not saved any combs of honey, feed the bees sugar syrup made of two parts of sugar and one part of water, by weight, and heat to the boiling point. Add a teaspoonful of tartaric acid just after removing from the fire, and stir thoroughly.

How to Feed Bees

WE HAVE, in previous issues, pointed out that the spring period is probably the hardest on the bees, because during that time they have more difficulty in keeping up the temperature of the cluster around the brood, and, in addition, they are compelled to build comb, produce food for the young, and work in the field. We should, therefore, be quite careful in keeping up the heat of the hive during cold spring weather. It is a common practice to feed sugar syrup or honey in an open pan on top of the frames, inside an empty super. However, this is a bad practice, and it is much better to use a friction top pail over a honey board, having the small opening in the center in which the bees escape is ordinarily used.

At the time when the bees are being examined to see if they need stores place a honey board, using the center opening, on the top of each hive, and then place the cover on top of it. When ready to feed, remove the cover and place an extra hive body on top. Then set the friction top feeder, with a few small holes punched in the lid over the hole in the honey board in such a way that the bees can get to it but, at the same time, the heat from below will not be allowed to escape to any extent because the rim of the feeder rests closely against the honey board.

It is surprising how quickly a colony of bees can lower a gallon of sugar syrup in this way, and this can be done even when the weather is chilly. On the other hand, if an open feeder is used the space above the frames will be open and the bees will be compelled to work hard to keep warm and thus they may pay no attention to the syrup at all.

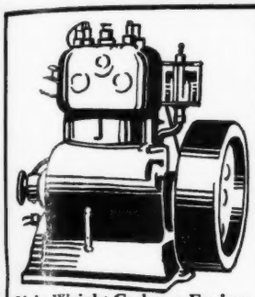
Fruit Growers' Responsibility to Beekeepers

EVERY fruit grower who reads this column is requested to refer back to page 41 of the January issue of 1925 to read the article on "How Bees Aid Fruit Growers." While it is well known that plants are not entirely dependent upon insects for cross-pollination, many experiments have been conducted which show conclusively that insects are of extreme importance in the cross-pollination of fruits and that the honey bee is by far the most important. Only a few of our fruit growers really understand, the absolute necessity of having bees in or near the orchard for the purpose of cross-pollination; it is extremely important that the fruit grower use care in spraying fruit trees, so that bees and other pollinating insects will not be destroyed. Every fruit grower in America should co-operate with nearby beekeepers in not spraying trees when in bloom and thereby causing the death of many of these valuable insects.

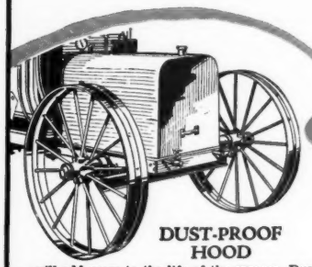
Beekeeping Conditions the Same Everywhere

THE EDITOR of this department has just returned from a trip to the Pacific Coast and finds that practically the same condition exists in every section, although there was little honey produced anywhere this season. Prices have not advanced in proportion to the demand, and the progressive beekeepers complain that this condition is entirely due to the fact that so many of our beekeepers continue to sell at low prices, regardless of the cost of honey production or demand. In view of the short honey crop in 1924, beekeepers are fully justified in expecting better returns from their crop than many have been asking. Fruit growers should bear this matter in mind in selling their honey.

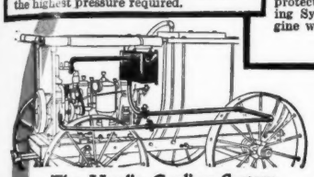
Why Buy A Sprayer Without These Strong Features



Light Weight Cushman Engines
—weigh ⅓ to ½ less than others of equal power—one of the reasons why Hardie Sprayers give the greatest power per 100 lbs. of weight. They are high speed engines, providing an even flow of power of enough volume to maintain the highest pressure required.



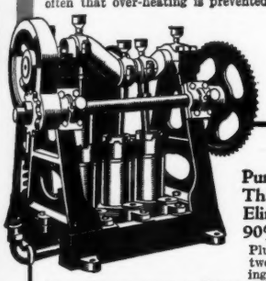
DUST-PROOF HOOD
—will add years to the life of the sprayer. Dust-cutting has always been at a minimum in Hardie Sprayers, due to protective housings and micrometer fit. But the hood provides the last word in protection. Its use is made possible by the Cooling System shown below, without which the engine would overheat.



The Hardie Cooling System
—extends through pipes in the spray mixture tank. The amount of the liquid spray is so great and is replenished so often that over-heating is prevented.

Suction Setting Chamber
—stops the rapid movement in suction line long enough for sand and heavy foreign matter to collect and settle before the spray liquid passes to pump.

Porcelain-Lined Cylinders
—made from semi-steel castings, machined to a gun-barrel finish. Coated by an improved process with very hard porcelain. Bore is perfectly true and hard as glass.

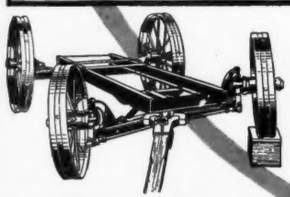


Pumps That Eliminate 90% Wear
Plungers have two soft packings to guide them; all wear comes on these; replaceable in two minutes. No crossheads or guides. Porcelain-lined cylinders. Bronze bearings. Extra heavy crank shafts. Machine-cut gears. Light running, yet gives high pressure and capacity. Has accurate pressure regulator.

Air Cleaner
—has proven 99% efficient in dust separation. Cleans automatically by centrifugal action.

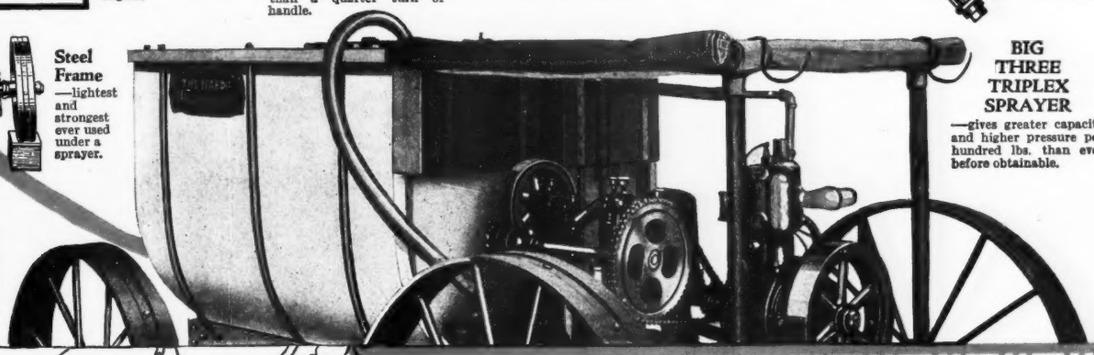
Treats 25% more air than the engine uses. Small, compact. Means longer life for engine.

New Hardie Gun
—gives a wider range than any gun heretofore and gives perfectly even distribution. Makes as fine a mist as the finest nozzle and throws it a greater distance than ever before accomplished. Completely controlled by less than a quarter turn of handle.



Steel Frame
—lightest and strongest ever used under a sprayer.

Underslung Autoplex Truck
—has low center of gravity, as the load is carried but 12 inches from the ground. Insures heavy traction, because of large wheels, broad tires and wide track. Safe on side hills. Pivoted wheels (as on autos) prevent pole-whipping and allow turning in 20-ft circle. Rocking bolster relieves strain on frame on rough ground.



BIG THREE TRIPLEX SPRAYER
—gives greater capacity and higher pressure per hundred lbs. than ever before obtainable.

A SPRAYER is something you do not buy often—at least this should not be the case. Therefore it is worth while to make a thorough investigation and make the most of your purchase. Investigation is the very thing that sells Hardie Sprayers. We like nothing better than to take prospects through our factories, either at Hudson, Mich., or Portland, Ore., and show prospective buyers how thoroughly everything is made and how carefully all parts are assembled.

The best we can do is to call your attention to a few of the major details of Hardie construction. In addition to the illustrations shown on this page, we urge that you consider the following superior Hardie features:

1. Their *dependability* at critical times insures Hardie Sprayers quickly paying for themselves. Their *durability* means paying for themselves many times over.
2. Highest pressure needed for any work, with pressure regulator that holds pressure right to dot and takes load off engine, when guns are closed.
3. High Carbon Steel Automobile Frames: Weigh less than common steel and are stronger.
4. Simple, compact design. No adjustments where you can't get at them.
5. No more delays at spraying time.
6. No more big costs for upkeep. A few cents a year may suffice.
7. Hardie Sprayers have stood the test of time—25 years of satisfactory service.
8. Made in many sizes—power and hand—to suit your exact needs.
9. Hardie dealers are plentiful in every fruit section. Complete stocks of parts are carried on hand. "Service seldom needed, but SERVICE when you do need it."
10. And Hardie Sprayers and dealer-service are recommended by thousands of growers.

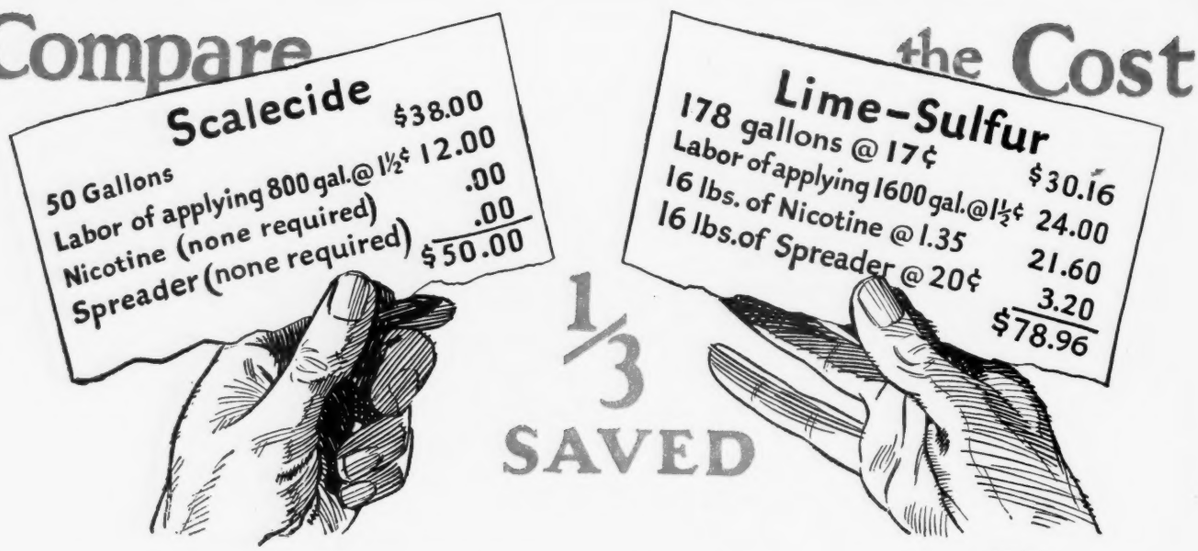
Write for Our New Catalog. Get Acquainted With the Hardie Line

HARDIE MFG. CO.
Main Office and Factory: 1010 Mechanic St., HUDSON, MICH.
Branch Factory: Portland, Ore.
Branches: Los Angeles, Cal., Kansas City, Mo., Petrolia, Ont.
Distributors at: Brockport, N. Y., Hagerstown, Md.
Tampa, Fla., Cornelia, Ga.
and Macon, Ga.

HARDIE SERVICE MAP
BRANCHES and DEALERS IN ALL FRUIT DISTRICTS
PETROLIA ONTARIO CANADA BRANCH
BROCKPORT NEW YORK BRANCH
PORTLAND OREGON BRANCH FACTORY
HUDSON MICHIGAN FACTORY MAIN OFFICE
HAGERSTOWN MARYLAND BRANCH
LOS ANGELES CALIFORNIA BRANCH
KANSAS CITY MISSOURI BRANCH
CARTER IMPLEMENT CO. MACON GA DISTRIBUTOR
TAMPA FLORIDA Gulf Fertilizer Co. Tampa DISTRIBUTOR

DEPENDABLE HARDIE SPRAYERS

Compare the Cost -



50 gallons of Scalecide diluted 1 to 15, making 800 gallons solution sprays the same trees until they drip as 178 gallons of lime sulfur diluted 1 to 8, making 1600 gallons solution.

APHIS is best controlled by the delayed dormant spray—just as the aphis eggs are hatching. Later sprayings, when the aphis are protected by the curled-up leaves, are ineffective. Scalecide has the record of 100% aphis kill without the addition of nicotine or anything else. The cost is ⅓ less than lime-sulfur combined with nicotine and a spreader. Why not make this saving?

Scalecide applied as a delayed dormant spray not only controls aphis and scale, but also European red mite, leaf roller, bud moth, pear thrips, leaf miner, case bearer and fungus or blight cankers from which are spread fire blight, collar rot and root rot. And in addition, year after year use of Scalecide invigorates the trees. Moreover, beside all these benefits, it is *pleasant* to use.

The economy of Scalecide is shown by the fact that the $11.50 drum of Scalecide will spray an average orchard of 75 to 100 twenty-year old apple trees until they drip—or as many trees as one 50-gallon barrel of lime-sulfur applied with equal thoroughness. To the cost of lime-sulfur for your delayed dormant spray you must add the cost of nicotine and a spreader. For larger orchards the saving with Scalecide is tremendous, as shown in the comparative tables above.

Not only do you save because Scalecide is the *complete* dormant spray but also because it requires only half the labor to apply it. In our own orchard, 11000 gallons of dilute Scalecide sprayed the same trees as 25000 gallons of dilute lime-sulfur the year before.

Drum $2 extra: returnable

Scalecide Prices

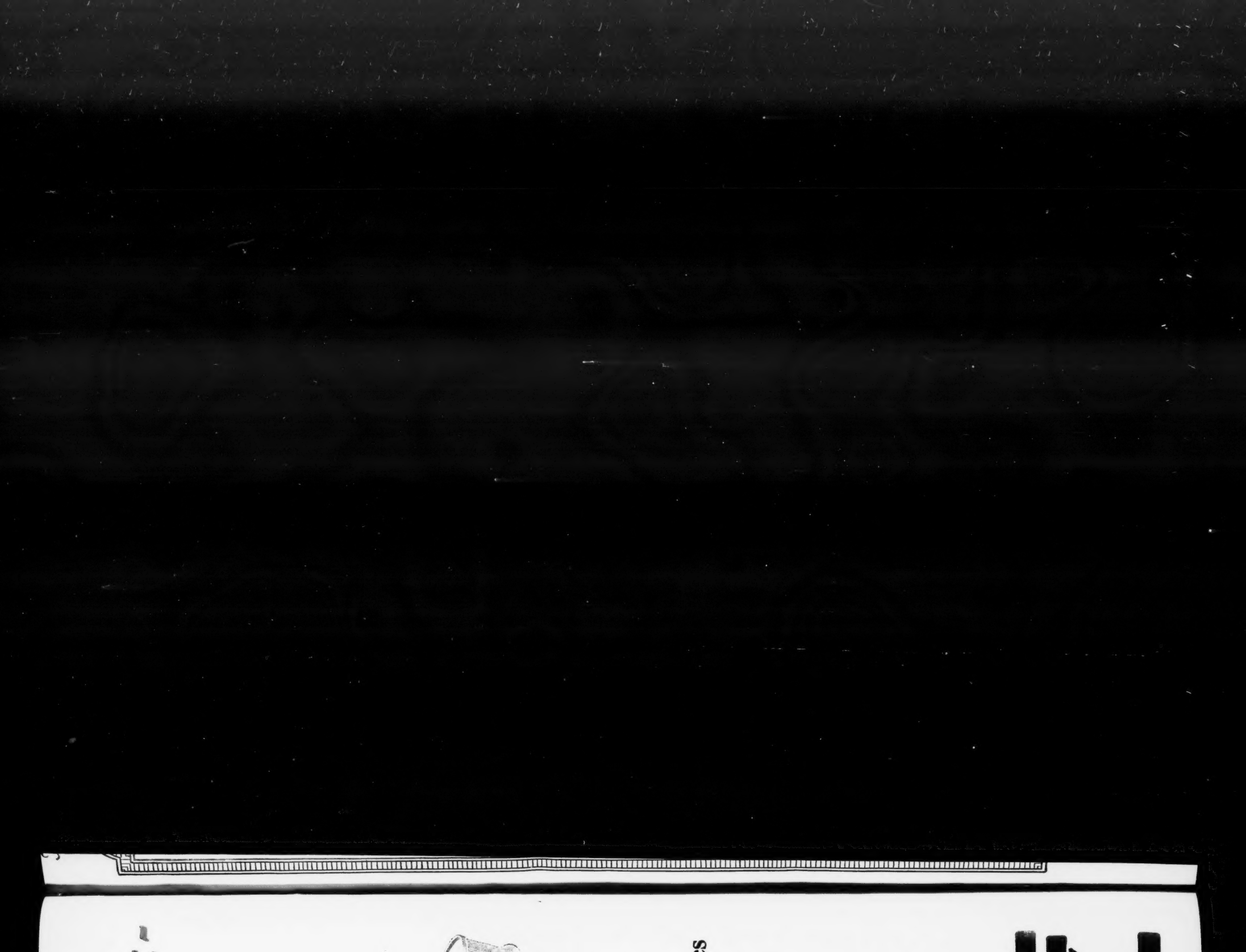
Delivered East of the Mississippi

50-gal. bbls.	$38.00
15 gals. 11.50 / Drum 2.00 (returnable)	13.50
2—5-gal. cans	10.60
1—5-gal. can	6.25
1—1-gal. can	1.75
1—1-quart can	.75

If your dealer doesn't carry Scalecide show him this advertisement—or order direct from us. Send today for free book, "Economy of Scalecide."

B. G. PRATT CO. Department 11 50 Church St. NEW YORK, N. Y.

SCALECIDE

THE COMPLETE DORMANT SPRAY

SCALECIDE